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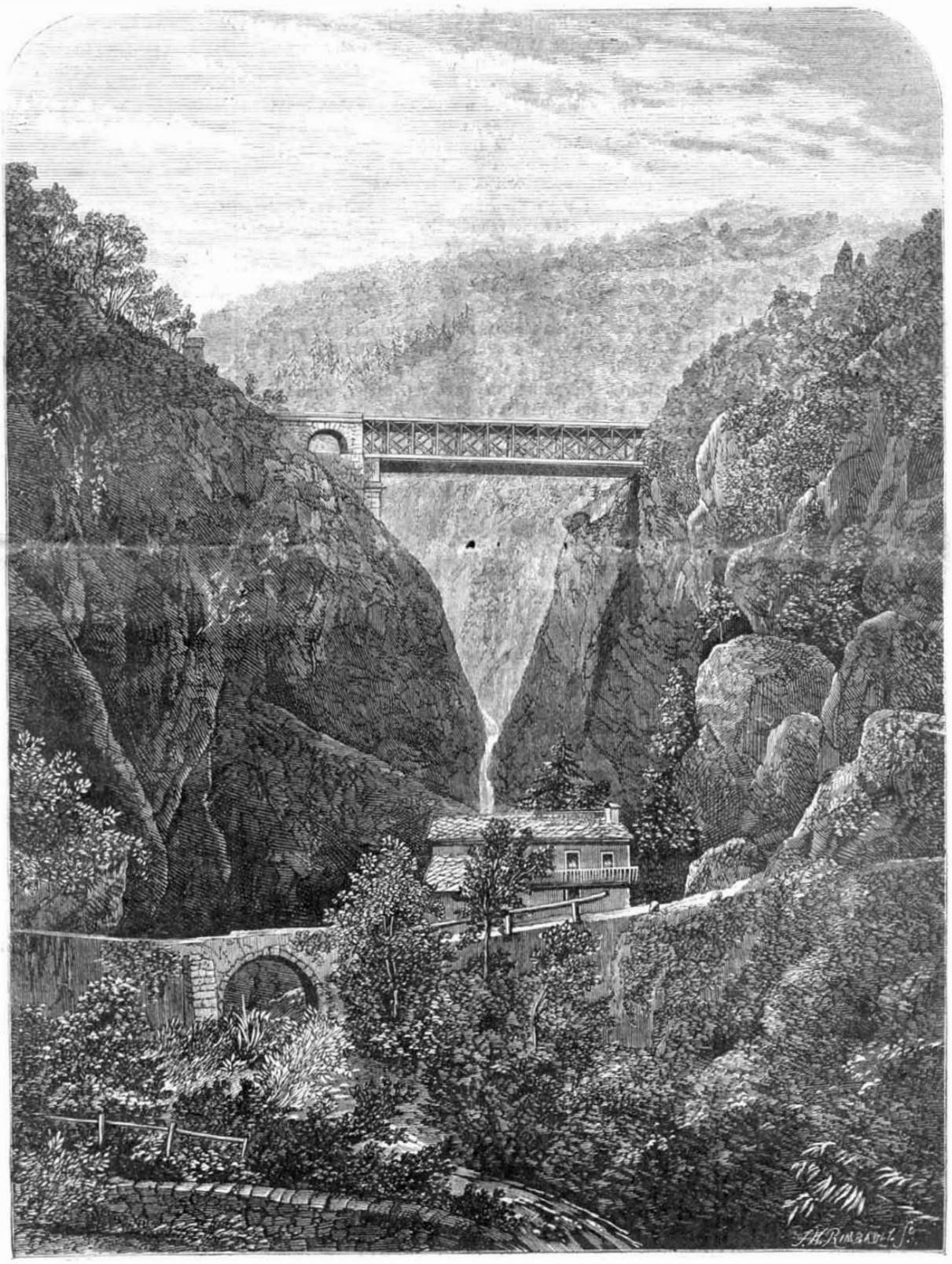
BRIDGE ON THE MONT CENIS RAILWAY.

Although the opening of the Mont Cenis tunnel has effected a great saving of time, not only between France and Italy, but between England and India—the direct route from Calais to Brindisi, the Italian port of embarkation for the East, *vid* the Suez Canal, being now used for passengers and mails—travelers in search of the picturesque probably prefer to travel over the mountain, using Mr. Fell's railway, and obtaining views of the grand scenery of the Alps from the highest of those peaks which has as yet been crossed by an artificial road. Of the nature and difficulties of the work, and of the glimpses of rock and precipice afforded by the many ravines it crosses, our illustration (selected from *Engineering*) will give an excellent idea. It is a view of the bridge at Comba Scura in the Piedmontese Alps, which crosses a gorge, at a hight of 395 feet from the ground. The span is 185 feet between the abutments; the width is 14 feet 9 inches, and the depth 18 feet. Over 200 tuns of iron were used in the construction, and the work showed a deflection of $\frac{2}{3}\frac{7}{3}$ of an inch, under a strain estimated at 4 tuns per square inch. This bridge, and others similar to it, were designed by the Italian Government engineers, and constructed by Fleet and Newey, of West Bromwich, England.



COMBA SCURA BRIDGE, ON THE MONT CENIS RAILWAY.

Honors to an Inventor.

In France, Frederic Sauvage is considered to have the largest share of merit in practically applying steam power to the screw propeller, which he did in 1832. The town of Boulogne-sur-Mer, where Frederic Sauvage was born on the 20th of September, 1786, has lately gone to considerable expense in awarding him posthumous honors, which culminated in the uncovering of a monument to his memory. At 10 o'clock the government, municipal, naval, and military authorities, deputations from various cities, headed by M. le Baron de Latouche, Sous-Préfet, and M. Huget, Maire, started in procession from the Hôtel de Ville for the cemetery to which the remains of Frederic Sauvage were removed from Paris and interred with public honors on the 20th of September, 1872. The monument over his grave is a square pediment in three portions, made of gray marble of the same kind as the Napoleon Column is built, and obtained from the Marquise quarries. It rises to the hight of 14 feet, and on the top a bronze heroic sized bust of Frederic Sauvage is placed.

On either side of the monument is an inscription setting forth the date of his birth, death—19th July, 1857—the translation of his remains, and a list of his inventions. On the front are the two words "Frederic Sauvage," and a bronze bas-relief showing a vessel with a screw propeller, a pantograph—*procédé Collas*—a physonotype, a horizontal mill for sawing marble, and a *soufflet hydraulique* for raising water, all of which were either invented or perfected by F. Sauvage, who, in addition, invented the *conformateur*, an instrument for measuring the head, the *physionomètre*, and n automatic boat.

The bronze bust and bas-relief were modeled by Mr. John Hopkins, and were cast by Messrs. Thiebaud et Fils, of Paris.

Frederic Sauvage's life was similar to those of many other inventors, in that he spent his days and fortune in perfecting inventions which brought him no profit. Having lost his own money, he borrowed from others, and, being unable to repay, was thrown into a debtor's prison, which he afterwards exchanged for a madhouse, where he died on the 19th of July, 1857. The monument was designed by M. de Bayser.—*London Times.*

A Human Ostrich.

The curious cases which we recently mentioned of persons, one of whom swallowed a fork and another a thermometer, are completely overshadowed by that of an individual who recently died in an asylum in Prestwich, Eng. A medical contemporary, in its account of the *post mortem* examination, gives the following catalogue of the contents of the man's stomach: 1,639 shoe pegs, 6 nails four inches in length, 19 nails of three inches, 8 of two inches, 58 of one inch; 39 metal eyelets, 5 copper screws, 9 copper buttons, 20 scraps of buckles, 1 pin, 14 bits of glass, 20 pebbles, 3 pieces of twine, a fragment of leather three inches long, a piece of lead four inches long, and a bodkin bearing an American trade mark. In all, 1,841 objects, weighing a tota of 11 pounds and 10 ounces. The person was crazy, and his mania, whenever unwatched, consisted in swallowing any small object. It is remarkable, however, that the functions of digestion could continue with this immense mass in the stomach.

Educated Birds.

The Baltimore *American* gives the following account of a troupe of trained Java sparrows and parroquets, now exhibiting in the streets of that city:

"When a suitable place is found, a circular table is opened and the birds are all turned loose upon it; they manifest no fear at the crowd, and do not offer to escape. The performance consists of ringing bells, trundling small wheelbarrows, slack wire walking, firing off pistols, dancing, swinging each other in small swings, an excellent imitation of a trapeze performance, and a number of other equally interesting tricks. The most wonderful part of the performance, however, is done by a parroquet. This bird walks to the center of the table, and, after bowing to the crowd, seats himself in a small chair near a bell. To the clapper of the bell there is attached a small cord, and any one in the crowd is allowed to ask the bird to strike any number of times upon the bell. If asked to strike ten times, he leaves the chair, seizes the bell rope and pulls it ten times, after which he bows and returns to his seat. This was repeated a great many times, and with one exception the bird made no mistake. The bird will strike twenty-seven times, but after that he refuses; and his owner states that he has worked nearly a year to get this bird to strike up to thirty, but it appears that his memory gives out at that point, and it is unable to count further. A collection is, of course, taken up after each exhibition."

Roman Remains.

An important discovery has been made at Highwood, near the village of Ashill, in Norfolk, England, consisting of a vast collection of Roman remains in an oak-lined well, 60 feet deep. The Norfolk and Norwich Archæological Society recently visited the spot, when the well, under the superintendence of Mr. Barton, was emptied of its contents by a number of workmen. The well contains a great variety of articles, the most abundant being urns, of which about 100 have been obtained; more than fifty of these are perfect, and many of most beautiful form and ornamentation. There is considerable doubt as to the purpose which these wells were intended to serve; there are other two at Ashill, and others have been found elsewhere.

Vigorite.

The account of trials of this newly discovered explosive, at Stockholm, states that a charge of about eight ounces, made up in five cartridges and deposited in an excavation, raised a block of stone of 163 cubic feet. It would have taken over fourteen ounces of dynamite to have produced the same effect.

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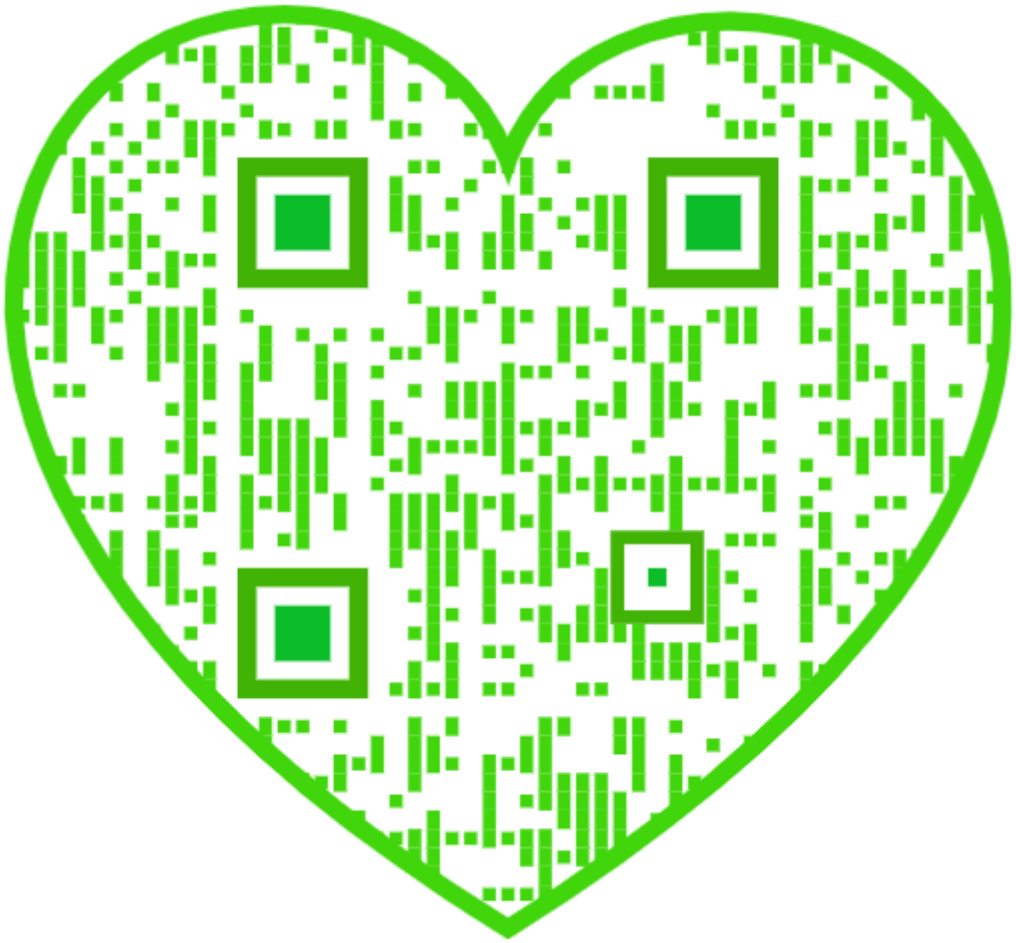

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SUCTION.

As our readers may have observed, a number of inquiries have recently been made in regard to the action of pumps and siphons: whether the water delivered by these machines was sucked up by the action of the mechanism, or forced up by the pressure of the atmosphere. To these questions we have answered: that there is, properly speaking, no such principle as suction, meaning thereby that water would not rise in a void space unless some pressure was applied to force it up. Until it was demonstrated by Torricelli that the atmosphere had weight or pressure, it was popularly believed that a liquid would rush into an empty space, because "Nature abhorred a vacuum." We judge, from the tenor of many of the letters sent to us, that this belief is not, as yet, wholly dissipated; and some elementary works on natural philosophy treat the subject in such an obscure manner as to confirm their readers in this opinion. It may be added, also, that one of the earliest accomplishments acquired by the infant is that of sucking, although we venture to assert that the exact nature of this process is not generally understood. It may be useful and interesting, then, to examine the action of the common pump, and compare it with that of the human mouth when engaged in sucking liquid through a tube. The common pump, in its simplest form, consists of a cylinder containing a tightly fitting piston, a pipe connected to the bottom of this cylinder extending into the water; at the bottom of the cylinder is a valve which opens when pressed from beneath, and there is a similar valve in the piston. Now suppose the piston to be at the top of the cylinder, which, together with the pipe, is filled with air. As the piston is forced down, it compresses the air in the cylinder, so that the valve in the piston opens and allows the air to escape. When the piston is pulled up, there is a void space beneath it in the cylinder, so that the pressure of the air on the water outside of the pipe forces it up some way in the pipe, opens the valve in the bottom of the cylinder, and forces some of the air from the pipe into the cylinder. After a few strokes, the water will be forced into the cylinder, and then, as the piston descends, the water will rise through the valve in the piston, and be carried out on the upward stroke. If the pump cylinder is placed at a greater distance above the surface of the water than the hight of a column of water equal in pressure to the atmosphere, no water will be forced into the cylinder—showing, as Galileo ironically asserted to the advocates of the suction theory, that, if Nature does abhor a vacuum, its abhorrence only extends to a hight of 34 feet. Again, if the water be placed in a tight vessel from which all the air is exhausted, and the pipe from the pump extends into the water with an airtight joint, the pump will cease to draw water, no matter how perfect the suction may be. A similar experiment conducted with the human suction apparatus, the mouth, will give a like result, proving that something more than the removal of the air is necessary in elevating water. To show that the suction of the mouth is similar to the action of the common pump, suppose a short tube to be held between the lips, the other end being immersed in water. The first operation is similar to the downward motion of the pump piston, the tongue being moved forward or upward against the palate, commencing at the root and filling the mouth. Next, as in the case of the ascending piston, the tongue is drawn back or bent down, creating a void, into which the water is forced by the pressure of the air, this pressure depressing the cheeks at the same time. The tip of the tongue is then applied to the teeth, to prevent the return of the water, and this action corresponds to the closing of the valve in the bottom of the pump cylinder. Finally, the tongue is pressed against the palate, commencing at the tip, forcing the water back; and the mouth being relieved of the water, the former operations are repeated.

This is only one illustration of the many that could be given to show that natural operations are conducted on truly scientific principles, so that the investigations of scientific men for the discovery of natural laws are among the most important and practical of the labors of the human race.

The action of the siphon may properly be considered in this connection. It appears to be the belief of many of our correspondents that the column of water in the long leg of the siphon, being heavier than the short column, pulls it along, and that the pressure of the atmosphere cannot render any resistance, since, if anything, it is a little greater at the lower end of the siphon, and so would rather tend to force the water back. A simple experiment, that can readily be made, is to place the short end of the siphon in an exhausted receiver, filling the tube with water, when it will be found that the liquid is discharged into the receiver, instead of flowing out at the other end; so that by this means the action of the siphon can be reversed, water being drawn through the long leg and delivered at the short one. The correspondents above referred to seem to think that the water in a siphon is something like a rope over a pulley, the part on one side being longer than that on the other, so that the weight of one part overbalances the other and draws it down. The trouble with this conception is that the water is an exceedingly weak rope; and if the heavy part starts to draw the other along, the rope will break in two, unless it is forced from behind. In reality, then, the action of a siphon is something like that of a rope over a pulley, the strength of the rope being about fifteen pounds per square inch. Thus, as long as the distance from the highest point of the siphon is no greater than the hight to which the pressure of the air will raise the water, this pressure keeps the rope of water together, and the flow goes on continuously. But if this hight is exceeded, the air can no longer force the water up, and the rope breaks, leaving in the upper part of the siphon that vacuum which Nature was said to abhor. It would appear, therefore, that the heavy column in the long leg of the siphon only draws or sucks along that in the short leg when there is something to push, that does all the work until the water is transferred to the long leg; and the sucking force gives out simultaneously with the failure of the pushing force to elevate the water to the highest point of the siphon.

OPERATIONS OF THE PATENT OFFICE.

We publish on another page an abstract from the annual report of General Leggett, now Ex-Commissioner of Patents, showing the operations of the Patent Office for the year ending September 30, 1874

The Ex-Commissioner dwells with commendable pride upon the increased proportion of patents granted, and the diminished proportion of rejected cases—a result due, he suggests, to the publication, in a popular, accessible form, of weekly abstracts of all new patents, together with the full specifications thereof. We have, on several occasions, expressed the opinion that the more widely the publication of the patents was extended, the greater would be the increase in the number of patents granted, and the less the necessity of maintaining so large a standing army of officials as we have now at the Patent Office.

We are glad to perceive that the Ex-Commissioner has at last reached the same view. He has heretofore been an advocate for the increase in the number of examiners; but his present conclusion is that, by extending the printing, the present large force of examiners may be diminished.

Since the presentation of this report, the Hon. J. M. Thacher has assumed the duties of Commissioner of Patents, and the public will look with interest for the development of the line of policy that is to characterize his administration. He has on former occasions given expression to views which would lead us to suppose that, under his rule, the Patent Office would surely be conducted in the interest of inventors. But there are some indications of a contrary policy. For example: In some of the classes, he permits inventors to be harassed by long delays; while in respect to that large class of applications known as compositions, especially medicines, he is daily sending out, under his official signature, decisions like the following: "This application is finally rejected on the ground that physicians' prescriptions are not patentable."

The author of such stuff is evidently a quack in patent law, whatever may be his pretensions in medicine. Such decisions are not only absurd, but they are in direct violation of the law and the previous practice of the Patent Office. The 24th section of the patent law expressly provides that any person who has invented any new and useful composition of matter, or any new and useful improvement thereon, may obtain a patent therefor. Medical compositions or prescriptions rank among the most important of discoveries. Hundreds of such patents have heretofore been granted, and have resulted in the production of many new and valuable medical remedies, by which life has been saved and health promoted.

With a few exceptions, such as above indicated, we believe that the examiners of the Patent Office are animated by a desire to serve the country according to the best lights they have. But we fear they are not sufficiently awake to the real purpose and intent of the patent laws, which is to encourage and assist the inventor. There is a tendency to looseness, inefficiency, and injustice on the part of the Patent Office in its decisions. This is strikingly shown by the astounding fact that some 7,500 applications for patents were last year condemned to the category of the rejected. The conclusion is irresistible that, if the claims of these applicants had been properly considered, if the Patent Office officials had in every instance, as in duty bound, extended the encouraging word and the helping hand to these inventors, the number of rejections would have been far less. We earnestly hope that the new Commissioner will bestir himself and try to promote the needed reforms.

WHAT IS STEEL?

At the time of the Vienna Exposition, this question was brought up and resulted in numerous discussions among the metallurgists assembled at the Austrian capital. Professor Jordan, of the Central School, and M. Greinert, Superintendent of the Seraing Steel Works, proposed that the proper definition of steel was "all malleable siderurgical products obtained in a melted state," and to reserve the name wrought iron (*fer*) for such malleable products as were not submitted to fusion. According to this, however, natural steel, puddled or forged, and cemented steel would be no longer steel, in spite of the properties which distinguish these from soft iron. In a word, steel, whether melted or not, is a product which places itself, from all points of view, between cast iron and wrought iron. The various ferrous products encountered in the arts form a continuous series from the softest and purest iron up to the most impure cast metal; or rather, there are two continuous but diverging series, both commencing at pure soft iron. The one ends at black or dark gray pig, including untempered or unannealed steel; the other, terminating at white cast iron, more or less manganiferous, includes tempered steel.

M. Gruner, in his recent report of the progress of the coal and iron industries, as developed at the late Vienna Exposition, after advancing the views last given, arrives at the conclusion that we should understand, by the term steel, all iron (whether melted or not, more or less pure) which is susceptible of tempering, but which is malleable, hot or cold, so long as it has not been submitted to sudden cooling. Soft iron, whether melted or not, is ever malleable, hot or cold, but not susceptible of tempering.

As puddled, as well as refined and cemented steel, is distinguished from melted, Bessemer, and Martin steel, etc., so also should soft iron be divided into puddled and homogeneous iron. This last may be especially subdivided into the homogeneous metals of Bessemer, Martin, Siemens, etc. It should not be forgotten, however, that, though the types are well characterized, there is a gradual passage from one to the other. Thus homogeneous iron passes in an insensible manner to cast steel, as soft iron, simply refined, passes to hard steely iron, then to properly called natural steel, which itself terminates in wild steel (*wild stahl*) for wire drawbenches, before attaining the true white cast iron.

RUSTING OF RAILWAY RAILS.

At the recent session of the American Association for the Advancement of Science, Professor Haldeman read a paper on this subject, showing that railway rails when in use oxidized but very little, but when not in use were subject to rapid oxidation. In fact, disuse for one day, for example, Sunday, resulted in a visible increase of rust of the track rails. This, in the opinion of the author, would indicate that, in chemical combination, vibrations may interfere with the molecular arrangement of the elements. In the discussion which followed, Professor Vander Weyde took the same view, and thought that molecular relations tended to prevent rust. But other speakers combated this view, and it was suggested that possibly the oil employed upon the locomotives might be more or less spread in a thin film over the rails in use, and thus prevent their oxidation.

Professor Robert Mallet, of London, has had his attention called to this discussion, and in a recent note to *The Engineer* states that some thirty years ago he was requested to examine and report upon the same matter on behalf of the British Association for the Advancement of Science, a grant of money being allowed for the purpose. He made a variety of experiments and examinations, all of which were duly reported. He found, in brief, that one of the reasons, why rails when used corrode less than the same rails when not

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used, is because the vibration of the used rails tends to shake off the rust formed, so as to prevent its prolonged contact with the metallic iron from accelerating the corrosion of the latter.

THE MECHANIC OF THE FUTURE.

An esteemed correspondent desires us to call attention to the difficulty in finding mechanics able to fill situations where special knowledge is required, and to the hindrances thrown in the way of capable men by trade rules and customs, prescribed and enforced in the interest of the worthless and incompetent.

This country is almost overstocked with professional men; and whenever education and ability are united in a young man, he is almost sure to quit the practical part of his trade, and become a consulting engineer and an expert, living by fees instead of by wages, and selling his knowledge and not his skill. Thus, men of brains are taken out of the really working class; and many manufacturers look in vain, in the rank and file of their establishments, for men capable of being master mechanics. The question as to where our leaders and foremen are to come from is deserving of our best consideration; for there are many influences at work which are retarding the progress of the American working man. Boys and young men should especially bear in mind the value of acquiring a thorough knowledge of all branches of the trade by which they intend to earn their bread, so as to become capable leaders and instructors of others, less gifted and fortunate than themselves. The gentleman above referred to recently needed a first class machinist to superintend a certain branch of business, the specialties of which would require a few months of attentive study and practice. It is difficult to believe that the rules of a trade society, ostensibly organized for the protection of the rights of working men, prevented a skilled artisan from leaving an inferior position to be a superintendent; but it is nevertheless a fact. He stated that the union to which he belonged would not allow him to work for an hour at less than a certain rate, even though his temporary reduction should certainly lead him to permanent employment of great responsibility and credit, and consequently large remuneration. The employer, naturally averse to having his liberal offer thus treated, at once declined to promote the man on any terms whatever, as no one who would thus debar himself from getting on in the world was fit to be put over others, who would naturally follow his example and imbibe his ideas.

So many qualifications are wanted in a manager and superintendent of a machine business that fitness for the post is rare, and the ambition to fill it creditably ought to stimulate our workmen to study and improvement.

CHARACTERISTICS OF A BUSINESS KING.

During his career as a great contractor, the late Thomas Brassey was engaged in the construction of railways in England, France, Spain, Italy, Belgium, Saxony, Bohemia, Austria, Hungary, Moldavia, Syria, Persia, India, Australia, Canada, and South America, aggregating something like six thousand five hundred miles, besides water works, drainage schemes, docks, bridges, and other important undertakings. In the execution of these great works, he had, at various times, twenty-seven different partners; four hundred million dollars of other people's money passed through his hands; and at times the army of workmen to which his contracts gave employment numbered as many as eighty thousand men.

Such a record, to say the least, entitles Mr. Brassey to a high place among the great captains of industry to which the age of railway construction has given birth and occupation; and as one of the pioneers of a new order of men, his character is peculiarly worthy of study, more especially as he represents a type of man which the world is likely to have more and more need of with the spread of the industrial civilization which distinguishes our modern times.

Abundant materials for the study of Mr. Brassey's qualifications for an industrial leader are furnished in the volume on his "Life and Labors," prepared by Sir Arthur Helps: and though it is never safe to assume that all the characteristics of a successful man were essential or helpful to his career, and therefore worthy of imitation by those who would aspire to similar success, we may nevertheless easily detect those which were strikingly helpful; while the doubtful ones, even those most widely at variance with the popular ideal, may possibly have been factors worthy of recognition.

Before entering upon any analysis of Mr. Brassey's character, it is proper to notice, first, an important condition of his success in the great business of his life, a condition without which every other qualification would have been wasted. His business training was such as to give him a practical knowledge of nearly every kind of labor necessary to be understood for the accomplishment of great works of construction. This we put before any personal characteristic, since no man, however well fitted by Nature for the rank of master, can command to good purpose without a minute personal knowledge of the work to be done, a fact which ambitious youngsters are very apt to overlook. Mr. Brassey was fortunate in not being sent to school until he was twelve years old. At sixteen, he was apprenticed to a surveyor and real estate agent,—something different, by the way, from what the term implies with us—who subsequently took him into partnership. His first work of consequence was in connection with the laying-out of the once celebrated Holyhead road, of which all England was very proud. At the death of his instructor, Mr. Brassey became sole agent and representative of the owner of a large estate, in the care of which he had brickyards and limekilns to superintend. Later he had the management of a quarry, from which stone was taken for a viaduct on the Liverpool and Manchester Railway, the first for passenger traffic ever constructed. It was in connection with this quarry that Mr. Brassey made the acquaintance of George Stephenson, under whose advice he made his first (unsuccessful) tender for a railway contract. His next attempt was to better purpose; and at the age of twenty-nine, Mr. Brassey entered upon his life work as a railway contractor. His first undertakings received his personal supervision to their minutest details, thus laying the foundation for the higher and more valuable art for which he became celebrated in after years, the art of dealing with details in masses.

Thus Mr. Brassey was prepared by education for dealing with the great problems of railway construction. Let us consider briefly the personal qualities which he brought to the work. In the first place, he had the energy needful for great accomplishment. Said one who worked under him for many years: "If he'd been a parson, he'd have been a bishop; if a prize fighter, he would have had the belt." The physical basis was sound and enduring, and his activity untiring. With great capacity for hard work, he keenly enjoyed working hard, not so much for the profit it would bring as for the pleasure of doing. He could not bear to have work drag, nor to leave anything which he undertook undone or half done. Even when the pushing forward of work, arrested by accident or otherwise, involved the taking upon himself responsibility for expense which belonged elsewhere, he did not hesitate to go forward.

A striking illustration of this spirit occurred in connection with the Paris and Rouen Railway, his first great foreign contract. In the carrying out of this work, he was restricted in his choice of certain materials to French products; and in consequence of inferior lime for mortar, a rapidly built viaduct—a huge brick construction, a hundred feet high and a a third of a mile long, costing $250,000—fell down in utter ruin. It was suggested that, on representing the facts of the case to the directors of the company, some alleviation of his loss might be obtained. His reply was: "No: I have contracted to make and maintain the road, and nothing shall prevent Thomas Brassey from being as good as his word." Without stopping to discuss the question of responsibility in the matter, new materials were secured, and the work was reconstructed with a rapidity that was accounted marvelous. It is a satisfaction to record that the company voluntarily assumed the cost of the new structure.

With all his anxiety to have work done rapidly and well, Mr. Brassey never wasted his energy in worry. Having given his best efforts to ensure success, he was content to await the result and abide by it with perfect equanimity. This, as Sir Arthur justly remarks, is a great felicity of temperament. It gives a man of much work the staying quality known as "bottom" in a racer, and enables him to meet inevitable reverses without being crushed or disconcerted. It is the basis of the two-o'clock-of-the-morning courage, which the first Napoleon used to rejoice in, a quality which Mr. Brassey had to an eminent degree. If called up suddenly in the middle of the night, upon some urgent peril or difficulty, he met the alarm with perfect coolness; sat down to consider and calculate what was the best mode of obviating the danger; and before break of day, when he had to proceed to the scene of action, he was ready with his plan. Like master, like man. His example could not but be felt by his assistants, who took courage at his stability of mind, and gave their fullest confidence to a leader who always seemed ready for any emergency. In addition to this imperturable presence of mind, Mr. Brassey evidently possessed singularly quick and comprehensive powers to take in the essential conditions of a problem at a glance, uncommon power of rapid calculation, and great ability for organization—qualities which not only inspired his staff with confidence in times of difficulty or danger, but enabled him to administer complicated affairs with a royal ease and facility.

It was in dealings with his agents, however, that his most striking characteristics were displayed. In the course of his career, he carried into execution nearly two hundred contracts, many of them involving hundreds of miles of railway. The works for which he made unsuccessful tenders amounted to upwards of seven hundred million dollars. It is obvious that no man could examine the details of works of such variety and magnitude. He must necessarily trust largely to his agents; and it was in the choice of these, and his subsequent treatment of them, that Mr. Brassey's business sagacity came into full play. He chose his agents with great care and with consummate judgment. After that, he placed implicit trust in them; and though capable of exercising the most minute supervision and criticism, he never judged by details, but looked to results. His system of keeping accounts was what most men would consider loose, and his agents were entrusted with vast sums of money to be expended almost at their discretion; yet his financial secretary and confidential adviser upon all monetary matters testifies that not one of his representatives was ever known to deceive or rob him. When asked if this was to be taken as a proof of the general honesty of mankind, Mr. Tapp replied: "Not exactly that. I think it rather more shows that he placed so much confidence in those whom he employed, and put them, as it were, so much upon their honor, that they would not deceive him; and that people, who might not have acted uprightly with other masters, did so with him because they felt responsible to him, and also a certain amount of pride in being confided in by him to such an extent that they really carried on the business as if it were their own." His biographer adds his personal belief that the system of trust which Mr. Brassey adopted uniformly, in respect to all those who worked under him, was such as would be generally successful if carried out with that perfect faith and completeness which he always manifested in these transactions—a belief which might be considered Utopian had it not such a substantial backing in Mr Brassey's large experience.

In another connection, Sir Arthur observes that where most men fail in governing is in not entrusting enough to those who have to act under them. Most men intend well, and try to do their best as agents and subordinates; and he is the great man who succeeds, with the least change of agents and subordinates, in making the most of the ability which he has to direct and supervise. Besides, men must act according to their characters; and he who is prone to confide largely in others will mostly gain an advantage in the general result of this confidence, which will far more than counteract any evil arising from that part of the confidence which is misplaced.

That a man whose ruling passion was the execution of great works in a way which should win him renown for faithfulness, punctuality, and completeness in the execution of his undertakings should succeed, as Mr. Brassey did, by such a mode of dealing, with those on whose faithfulness and integrity his reputation depended, is cogent evidence that his plan of action was not far from correct. Not only did Mr. Brassey trust his subordinates, but they trusted him as implicitly. In the earlier part of his career, when each contract had his personal supervision, he allotted to each nominal sub-contractor his portion of the work, and fixed the price for it. Says one of them: "They did not ask him any questions. He said: 'There is a piece of work for you. Will you go into it? You will have so much for it.' And then they accepted it, and went to work." Their invariable willingness to take the work at his valuation was accounted for by the conviction, which each of them had, that if any mistake had been made, to their injury, Mr. Brassey always stood ready to make good the loss. In case a job turned out more difficult than had been anticipated, no appeal would be made; the work would go on according to contract until Mr. Brassey made his customary tour of inspection, when he never failed to recognize the contractor's position, and voluntarily set it right. When his undertakings became too extensive to be thus minutely inspected, the same policy was carried out through resident agents. To many this course may seem very unbusiness-like, but the result uniformly proved the wisdom of it. By treating his agents generously, he secured generous service in return, and was able to withdraw his attention more and more from matters of detail. He never wasted his time in doing work that an agent or subcontractor could do just as well. As to mere money grubbing, one of his principal agents testifies that he had not any of that in his composition, but he knew the value of money as well as any one, and how far a pound would go: nevertheless he had no greediness to acquire wealth, and he was always ready to give away a portion of his profits to anyone who was instrumental in making them, and that to a remarkable extent.

For illustrations of Mr. Brassey's hatred of contention, his uniform courtesy, his large-hearted unselfishness, his frank appreciation of merit of all kinds in others, and other qualities which pertain to the man rather than the contractor, we have no space. At the busiest period of his life, he would travel hundreds of miles to be at the bedside of a sick or dying friend or associate, to give what aid or consolation he could: a spirit which his staff rewarded as it deserved. The regard and affection which Mr. Brassey won from all those who served under him were most strikingly manifested during his last fatal illness. Men of all classes, humble navvies as well as trusted agents, came from great distances solely for the chance of seeing once more the old master they loved so well.

At a time when there seems to be a growing belief that a masterly man must be a stern disciplinarian, rough rather than gentle, brusque rather than courteous, exacting, watchful, a believer in the vile theory that every man must (in business) be treated as a rascal until he proves himself something better, it is singularly pleasing to review an exceedingly successful career, throughout the whole of which the opposite qualities are conspicuous. At a time, too, when financial treachery and eye service are supposed to be predominant, when the most minute and exacting checks upon the free conduct of agents fail to prevent "irregularities," it gives one fresh confidence in the general honesty of human nature to see the spirit of trustfulness made the basis of a great business, and to see it justified by service honorable to the highest degree.

That Special Edition.

The issue of a Special Edition of ONE HUNDRED THOUSAND copies of the SCIENTIFIC AMERICAN will come off soon after the first of December.

The names of parties to whom this large number of papers will be sent have been selected with care, and the publishers guarantee the issue to be fully 100,000, and it will probably reach 150,000 copies. The probability of this excess over the one hundred thousand is predicated on last year's experience. We then guaranteed 60,000, but actually printed and mailed 120,000 copies.

The papers will be mailed in separate wrappers, and the postage prepaid to every post office in the United States, Canada, and the adjoining Provinces.

The space allotted for illustrating new machinery and inventions is nearly all taken; but a few more good engravings, of first class inventions, may find place in the editorial pages, if immediate application is made. There is also a very little more space left for advertisers. See page 365 of this paper for particulars.

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Aniline Colors.

The following on the subject of aniline colors, from the pen of Mr. P. Kuntz, of Paris, may be useful as a concise *resumé*: The first colors employed were the violets; it was only in 1859 that aniline red was discovered, and by whom first is not clear. Aniline red, rosaniline, or fuchsin is now usually prepared by the mixture of aniline with arsenical acid and water, or aniline and arsenical acid found in commerce in the state of sirup, and which contains sufficient water for the purpose. Pure rosaniline has scarcely any color. According to the opinion of Hoffmann, generally accepted, the coloring matters produced by the various reagents from aniline are all salts of one and the same basis, the rosaniline. The colors of the salts of rosaniline are not permanent, they will neither withstand ley, soap, nor the effect of light; but their base serves in the preparation of other coloring matters which are of great interest. The resinous residue of the preparation of fuchsin, treated with different solvents, gives the chrysaniline, violaniline, mauvaniline, etc. The color recently introduced into commerce under the name of cerise, and the tint of which, less scarlet than that of fuchsin, approaches rather to poppy color, is also obtained from the residue of fuchsin. By treating fuchsin by means of various agents, and in various methods, the most varied tints of red are obtained. One of the colors most employed in the dyeing of silk, saffranine, the magnificent color of which approaches scarlet, is obtained by a method the details of which are but little known. The blue colors derived from aniline are produced by numerous methods, the great part of which remain laboratory curiosities. The number of processes which have entered into actual practice are relatively very few. The most advantageous are those first indicated by M. Girard and M. Laire, in which the salts of rosaniline are heated with aniline. It is believed that the production of these blues is based on the introduction of phenol into the composition of rosaniline. They are classed under the generic appellation of Lyons blue. Different phases of the manufacture yield different products, some of which are insoluble in water, and are called *bleu direct*, *bleu purifié*, or *bleu lumière*, the last being entirely exempt from any tinge of violet; the others, which are soluble in water, constitute the industrial coloring matters.

The *bleu de Paris* is obtained by the action of the bichloride of tin on the aniline of commerce. Other blues have been successively added to the list, some discovered accidentally, others by scientific experiments.

The violets likewise are the results of the action of various agents. They seem to be produced by the mixture of blue and red in very different proportions; in many of the processes, it is very difficult to obtain the precise tint required. According to the intensity of the preponderating tint, the violet is too blue or too red. The violet of Hoffmann, dahlia, is obtained by the mixture of rosaniline or of a salt of rosaniline with the iodide of ethyl and concentrated alcohol in different proportions. The violet of Paris results from the mixture of methylated spirit, chloride of ammonia, and aniline, by the method of MM. Poirier and Chappart. Perkin's violet, which was the starting point in an industrial sense, is prepared by bringing bichromate of potash into contact with sulphate of aniline, and treating the precipitate with wood spirit, which absorbs the coloring matter. The spirit is then evaporated and the residuum mixed with water with the addition of soda, which precipitates the coloring matter.

The most important green pigments derived from tar are those of Usebe and Hoffmann. The former was discovered accidentally, by a workman named Cherpin, who, not being able to fix aldehyde blue in a tissue, applied to a photographer, who recommended him to try hyposulphite of soda, the result was the production of a magnificent green color. Aniline browns are but little employed. Aniline yellows are numerous; most of them, however, have an orange or brown tint. Aniline black may be said to be almost exclusively for cotton.

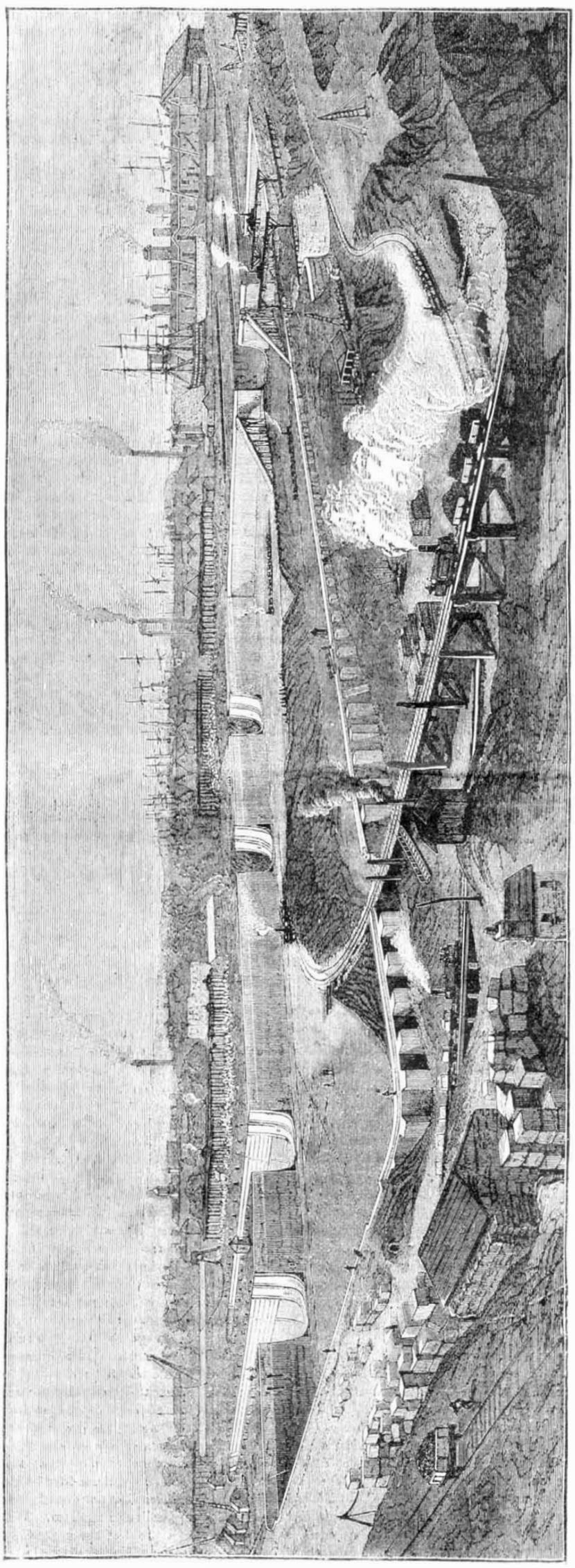
The employment of these colors is very simple. Silk, whether in hanks or woven, is dyed by simple immersion, and wool in the same manner. The same colors also serve for printing on silk and woolen fabrics. For cotton, the colors must first be mixed with albumen and then submitted to the action of steam; or they are printed on cloth prepared with tannin, which forms with the pigments insoluble products. Aniline is not the only substance derived from tar which yields coloring matter. Naphthaline, which distils at 428° Fah., yields among others the yellow of Marius, one of the most brilliant and purest yellows known, which dyes woolen and silk without mordant, from light citron to gold of the purest tint with true yellow reflections, differing from the greenish yellow shade of picric acid, another substance derived from tar. Naphthaline red is superior to the aniline reds, and possesses greater solidity; but it can only be employed for light tints, as it loses its brilliancy in the darker shades. These two are the only colors which naphthaline supplies at present to industry; the others have not sufficient purity, brilliancy, or freshness, and are too much affected by light and atmospheric influences; their price is also at present, too high.

Anthracene, which distils (at a temperature above 360°) with the last products of tar, has, on the contrary, a brilliant future, since the important discovery of its transformation into alizarine. Anthracene is still too dear to come into dangerous competition with madder; but its production and the apparatus used are being reduced to greater simplicity. It is a carburet of hydrogen. Artificial alizarine is prepared by means of bromine and potash. According to the calculations of M. Kopp, in order to replace completely the alizarine of madder and purpurine by artificial alizarine, 704 tuns of the latter would be required in the dry state, which is equal to 7,044 tuns of the raw color. It would require 2,720 tuns of the raw artificial alizarine to replace the true alizarine only; this quantity represents about 720 tuns of anthracene.

THE DOCKS AT PORTSMOUTH, ENGLAND.

The well known town of Portsmouth, in England, is not only a thriving business place and a commercial port of considerable extent, but it is the chief station of the British navy, and has, on this account, been so strongly fortified that it is deemed by many high authorities to be absolutely impregnable. The fortifications are bastioned ramparts faced with masonry, and inclose the whole town, to which entrance is permitted by four carriage ways; and outworks, in the form of trenches, are arranged to protect the inner line of walls. The harbor is only 220 yards wide at the entrance, but broadens to a width of about six miles; and on the waters of this naturally secure bay, the whole British navy can safely find anchorage.

The dockyards of this immense naval station, large as they are, are not sufficient for the accommodation of the ships under repair, and some very important additions are now being made. We publish herewith a view of the works now under construction, from which a good idea of their nature and magnitude may be formed. The immense blocks in the foreground show how concrete is coming into use not only in ordinary work, but in situations where strength and permanency are points to which expense is not to be compared. The large repairing and refitting basin, from which numerous dry docks of great size branch off, is nearly ready for the inlet of the waters, on which ride the ships whose masts are seen in the distance, towering above the buildings.



THE DOCKYARDS AT PORTSMOUTH, ENGLAND.—THE NEW REPAIRING BASIN AND DRY DOCKS.

Cutting and Storing Grafts.

There is no better time to cut grafts, says the London *Garden*, than at the commencement of winter. In cutting and packing them away, there are some precautions to be observed. In the first place, let them be amply and distinctly labeled, as it is very annoying to find the names gone at the moment of using them. For this purpose they should be tied up in bunches, not over two or three inches in diameter, with three bands around each bunch—at the ends and middle. The names may be written on a strip of pine board or lath, half an inch wide, a tenth of an inch thick, and nearly as long as the scions. This, if tied up with the bunch, will keep the same secure. For convenience in quickly determining the name, there should be another strip of lath, sharp at one end, and with the name distinctly written on the other, thrust into the bundle with the name projecting from it. If these bunches or bundles are now placed on end in a box, with plenty of damp moss between them and over the top, they will keep in a cellar in good condition, and any sort may be selected, and withdrawn without disturbing the rest, by reading the projecting label. We have never found sand, earth, sawdust, or any other packing substance so convenient, clean, and easily removed as moss, for packing grafts. It is needful, however, to keep an occasional eye to them, to see that the proper degree of moisture is maintained—which should be just enough to keep them from shriveling, and no more.

Live Fish Trade.

Arrangements have been made for placing on board one of the steamers, running between Liverpool and New York, one of the American aquarium cars, a newly invented contrivance for transporting live fish, which has succeeded very well in long overland journeys, and by means of which it is hoped to effect a useful interchange of living fish of various kinds between England and America. There are many American fish which might with benefit be introduced into England, and we at the same time might transport to the other side of the Atlantic some varieties of fish which are not found there.—*Nature*.

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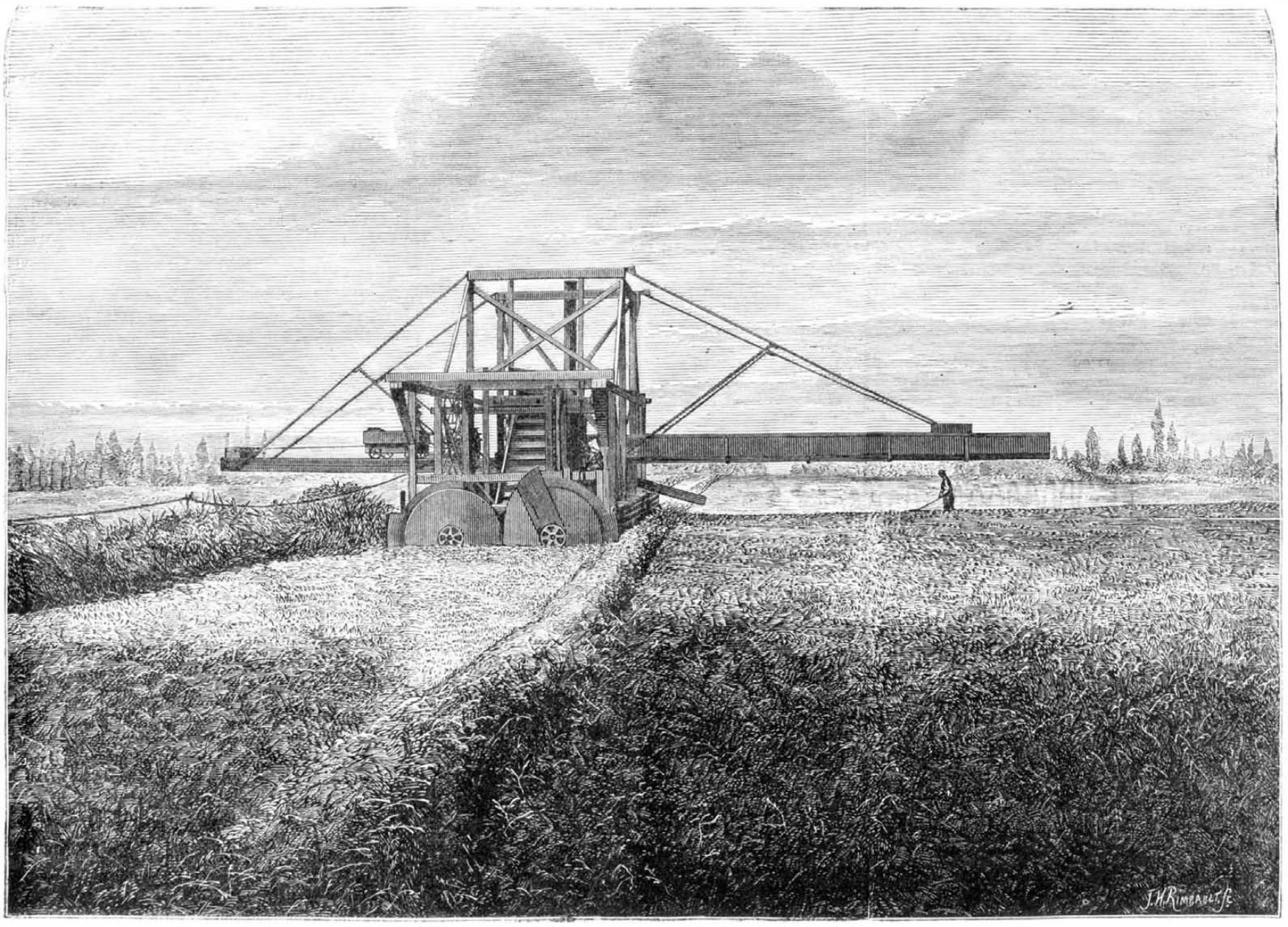

PEAT FUEL MANUFACTURE IN CANADA.—CUTTING AND PULPING APPARATUS. (See page 356.)

PEAT FUEL MANUFACTURE IN CANADA.—DRYING AND STACKING. (See page 356.)

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PEAT FUEL.

The difficulties in utilizing peat as fuel have been very widely discussed, but the operations at La Pigéonnière, Canada, have, by ten years' practical operation, proved the practicability of converting the substance into a clean and cheap fuel, the supply of material for which is, in many localities, practically unlimited.

The Irish peat, the formation of which is due to the moist atmosphere, when cut and dried in the air, is ready for use in furnaces, etc.; and the considerable formations in Somersetshire, England, and in the valley of the Somme, in France, are utilized in a similar manner. In Canada and this country, where the atmosphere is drier, a supply of surface water is required to produce the substance. It is fibrous in texture, and somewhat red in color; in drying, it loses 40 per cent of its bulk and about 90 per cent of its weight. Thus 10 tuns of the material must be dug out to obtain one tun of fuel; and its economical working is, therefore, a point of great importance. When dry, its heating capacity is about three fifths that of coal.

To render its combustion practicable, it must be pulped and disintegrated before drying, otherwise it is too loose in condition to form a good fuel. The pulping operation destroys a certain hygroscopic character that the dried raw peat assumes, and causes it to resist moisture and to be indestructible by frost.

Mr. James Hodges, C. E., is the engineer of the La Pigéonnière operations, and the process is described as follows: A center level line is traced out, and for ten feet on each side of it the surface is cleared of vegetation, the *débris* being piled up on each side to form two banks 20 feet apart. This arrangement is the preliminary work for a canal, and at one end of it a kind of dock is formed, for launching the apparatus shown in our first engraving. It being ascertained that the peat bog contains sufficient water to flow in behind the machine and fill the excavation, the cutting vessel is started. It consists of a boat of 80 feet length, 16 feet beam, and 5 feet depth, with two screws, of 11 feet diameter, in front, fitted with cutting blades and driven by an engine in the stern of the vessel. The blades cut their way through the bog; and as the water flows in as fast as the peat is taken out, the vessel moves forward, generally at the rate of about 15 feet per hour. Two men are required to clear the peat from pieces of wood, roots of trees, etc. When cut, the peat is lifted by an elevator and discharged into a hopper, and thence passes into a pulping apparatus, and flows off by a distributing trough. The two men occasionally add water to keep the pulp of a proper consistence, but no other hand labor is required. The distributing trough lies at right angles to the length of the boat, and may be lengthened to deposit the material at the required spot. The peat is left on the ground to dry, to the depth of about 9 inches; and when consolidated, it is ready for cutting into blocks. This is done with curved knives, placed 6 inches apart and mounted on a frame, and worked by two men. In a fortnight of favorable weather, the blocks are ready for stacking, which a gang of a man and three boys can perform at the rate of 4,000 blocks a day. They required to be turned and restacked to insure thorough dryness. Our second illustration shows this process.

Mr. Hodges states that, in 10 hours, from 300 to 400 tuns of peat can be excavated by this machine. This will yield about 50 tuns of dried fuel, and will leave a canal 150 feet long, 19 feet wide, and 5½ feet deep, in the peat bed. For this quantity, an average of 38 men for the day of 10 hours will be required. Fuel thus made has been burned in the locomotives of the Grand Trunk of Canada Railway, with a saving, it is said, of 45 per cent of the expense of coal, and a rather larger economy over that of wood.

The engravings were originally published in *Engineering*.

Wave Motion.

Mr. Deverell, of England has devised an apparatus by which the movement of a ship at sea is registered. From the results of a recent voyage, Mr. Deverell deduced the following: The duration of the voyage was 2,026 hours. During that time the ship made 1,764,088 beam oscillations or rolls, and 1,041,137 fore-and-aft oscillations or pitches. The average number of oscillations in both directions per minute was 14. The aggregate arc of pendulum registering beam movements was over 15,000,000 degrees, while that of the fore-and-aft movements was nearly 5,000,000 degrees." Mr. Deverell also considered that he had definitely established from these observations the following propositions: 1. That between ocean limits, the swell of the ocean is unceasing. 2. That the motion of an independent body within a ship on the ocean is unceasing. Here then was represented an immense amount of conservable energy, and the question remained: Could a practicable method be found for conserving it for use on board ship? Mr. Deverell believed that it could, and to a sufficient extent to be useful in auxiliary propulsion. He expects to be in a position in a few months to detail his method of putting his propositions into practice.

The Bicycle.

A remarkable instance of what can be done with the bicycle was recently exemplified in England. A match had been made between Mr. Stanton and Keen, the champion rider, to run 106 miles, the former to receive a start of half an hour. Stanton's machine had a driving wheel of 58 inches in diameter, that of Keen's being 4 inches less. Keen accomplished 50 miles in the extraordinary time of 3 hours 14 minutes 18 seconds, but was compelled to retire in the 91st mile, leaving Stanton to finish the 106 miles alone, which he did in 1 minute 5½ seconds less than 8 hours—an average of over 13 miles an hour, inclusive of a few short stoppages for refreshments, etc.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students. M.M.

Positions of Planets for December, 1874.

Mercury.

Mercury should be looked for in the morning. On the 1st of December, it rises at 5h. 22m. A.M., and sets at 3h. 32m. P.M. At this time it is well situated. On the 31st, it is not as easily seen, as it rises at 6h. 59m. A.M., and sets at 3h. 51m. P.M.

Venus.

Venus rises on the 1st of December at 8h. 17m. A. M., and sets at 5h. 3m. P.M.

On the 8th of December, Venus makes a transit across the sun's disk, affording an opportunity to astronomers to determine, by the best methods now known, the distance of the sun from the earth. To observe this phenomenon, expeditions have been sent to northern and southern stations by the United States, Great Britain, Russia, and other countries.

The transits of Venus which have been observed occurred in 1639, 1761, and 1769. The next after this of 1874 will be in 1882, and will be visible in this country. The transit of 1769 was observed in this country, and a curious pamphlet describing it was published at that time in Providence, R. I. The writer says: "The transit of 1761 was observed at St. John's, in Newfoundland, by John Winthrop, at the expence of the Massachusetts colony."

"To observe the transit of Venus in 1769, several observators were sent into the South Seas by the Royal Society in London; the Empress of Russia sent several companies into those parts of her empire where the visible duration was of the greatest length, and the King of France did likewise send observers into foreign parts."

On Dec. 31st, Venus rises at 4h. 59m A.M., and sets at 2h. 49m. P.M.

Mars.

Mars is not well situated for observers. It rises at 2h. 46m. A.M., and sets at 2h. 4m. P.M. on the 1st of December. On the 31st, it rises at 2h. 20m. A.M., and sets at 0h. 50m. P.M.

Jupiter.

Jupiter is also unfavorably situated for observations, rising on the 1st at 3h. 18m. in the morning, and setting at 2h. 20m. P.M. On the 31st, Jupiter rises at 1h. 43m. A.M., and sets at 0h. 33m. P.M.

Saturn.

Saturn is not as well situated as it has been through the summer. It comes to the meridian before dusk, and sets on the 1st at 8h. 57m. in the evening. On the 31st, it rises at 9h. 28m. A.M., and sets at 7h. 14m. P.M., so that it is scarcely possible to get a good view.

Uranus.

Uranus can sometimes be seen with the eye; and as it rises on the evening of the 1st, among the small stars of *Cancer*, at 9h. 24m., it could perhaps be seen at midnight. It rises on the 31st at 7h. 23m. P.M., and passes the meridian at about 2h. 30m. in the morning, at which time it has an altitude, in this latitude, of nearly 59°.

Neptune.

Neptune rises at 2h. 32m. P.M. on the 1st, and sets at 3h. 38m. the next morning. On the 31st, Neptune rises at 34m. after noon, and sets at 1h. 39m. the next morning.

Sun Spots.

The record is from Oct. 20 to Nov. 14, inclusive. The photograph of the 20th shows the three large spots of the 19th, with another of good size, very near the center, which was not seen on the 19th. The 21st was not clear; and on the 22d, this spot had disappeared, together with the most westerly of the other three. On the 23d, the two remaining spots were seen, the more westerly having perceptibly decreased in size, and on the 24th it had disappeared without reaching the edge. From the 26th to the 29th inclusive, the spots were few and very minute, the faculæ being very marked on the 27th. On the 30th, a large spot appeared on the eastern edge of the sun's disk, which proved to be the precursor of a fine group. Photographic pictures of Oct. 31st and Nov. 2d show two large, well-defined spots. Owing to clouds and fog, no pictures were taken from Nov. 2d to Nov. 10th; but the group was watched with a small telescope, and the two large spots were seen to divide into several smaller ones, the picture of Nov. 10th showing a group of six small spots within the western limb. On the 11th, the group was near the edge of the disk, and on the 12th it had disappeared, and the sun's axial motion had brought a small spot into view within the eastern limb. On the 14th, three groups of very small spots were seen within the eastern limb, and nearly in a line with the sun's equator.

IN describing a recent balloon ascent to the French Academy, M. Tissandier mentions having entered a bank of gray clouds at a hight of only 485 feet, this being lower than in any previous ascent. At one time, curiously, while the ground was completely hid from the voyagers, they ascertained, from the voices they heard, that they were distinctly seen from the ground. The clouds were transparent from below upwards, opaque from above downwards. M. de Fonvielle took spectroscopic observations of the sun at various hights, from 4,850 to 3,250 feet. The blue was observed to invade the space occupied by the indigo and violet rays, while the red was much the same as on the ground. On nearing the upper surface of the clouds again, the violet and indigo resumed their former extent.

Correspondence.

ENTOMOLOGICAL NOTES.

To the Editor of the Scientific American:

I send you a few notes on entomological paragraphs which have lately appeared in the columns of your journal.

BEECH BLIGHT.

Under this head, you published several communications last spring, one of which, from Mr. Jacob Stauffer, of Lancaster, Pa., contained the following words: "It would seem that this blight is not so very new after all. Westwood figures the larva of the *psylla betulæ*." * * "I would simply add that neither from Mr. Riley, Mr. Walsh, nor Mr. Harris could I learn anything further about the species, or if it were ever before noticed."

The insect is not the *psylla* referred to, and does not belong to the flea lice (*psyllodæ*), but to the plant lice (*aphidæ*). It was briefly described by Dr. Asa Fitch, in 1851, under the name of *eriosoma imbricator*, though it in reality belongs to the genus *pemphigus*. I have referred to it in the *American Entomologist*, vol. I., p. 58.

VESICATORY POTATO BUGS.

The Colorado potato beetle possesses no vesicatory properties; but the so-called old-fashioned potato beetles, belonging to the very same family as the Spanish fly (*cantharis vesicatoria*) all possess it in a high degree, and the fact was known and made use of not only nineteen years ago, but half a century ago. Kirby and Spence, in their invaluable "Introduction to Entomology," speak of these insects being used in place of the green European species, and Harris and most subsequent authors who treat of the *lyttæ* refer to the fact. Some years ago I caused large quantities of the striped blister beetle (*lytta vittata*) to be collected and properly dried, and from them Mallinckrodt Brothers, of this city, made an excellent cerate, which has been used with satisfaction by our local physicians. I would also state to Mr. E. S. Wicklin that these blister beetles have not become great strangers. *Lyttavittata* may be got in almost any year, by the cartload in this latitude, and they often ruin a potato field in a few days; while *cinerea*, *marginata*, and *atrata* frequently swarm on particular plants. The European *vesicatoria* abounds most on ash trees, and is collected principally from these trees, and with far more labor than is required to collect the *vittata* in this country. But such is the force of habit and the difficulty of diverting the course that trade has once taken, that our pharmaceutists still send to Southern Europe for their cantharides. But I presume they make as much profit on the one as they would on the other, and there is no particular inducement for them to encourage home industry.

THE PHYLLOXERA PREMIUM.

An item in one of your late numbers makes mention of the fact that one of your correspondents has discovered that the liberal use of cow dung is a sure cure for the phylloxera on vines, and—whether jokingly or not, I cannot pretend to say—calls upon the French Government to remit the amount of the reward, in case the proposed remedy prove effectual. It is a pity that your correspondent is so modest as to keep back his name, and a still greater pity, for him, that cow manure and cow urine were among the earliest supposed remedies thoroughly tried in France. The fact that he will not be able to prove priority of suggestion is all the more to be deplored, for the reward for a remedy has been increased from sixty thousand to three hundred thousand dollars. Cow manure is an excellent invigorator of the vine, and its use, as that of all other invigorators, is beneficial in counterworking the effects of phylloxera, but it is no *sure* remedy for the disease. CHARLES V. RILEY.

St. Louis, Mo.

What Temperature Kills?

To the Editor of the Scientific American:

I notice in your issue of November 7, 1874, an editorial article entitled: "What Temperature Kills?" In the third paragraph you say that "not one seed germinated after exposure to boiling water." I wish to state that the seed of the common locust tree will not only stand the temperature of boiling water, but will always fail to grow unless boiled for 8 to 10 minutes.

My father planted about 15,000 seeds of the common locust on four acres of land, and only about 50 seeds germinated. We now boil them for 10 minutes, or place them in cold water and allow it to come to a boil, and remove them three minutes afterwards. These seeds will grow finely after a large brush pile has been burned over them.

These are facts, occurring every year, to my personal knowledge. HIRAM VAN METER.

Macomb, Ill.

The Crystallization of Carbon.

To the Editor of the Scientific American:

I would like to add my testimony to what you have already published to the world on the crystalization of carbon, especially as at last we seem to be on the high road to success.

Twenty years ago, while conducting experiments for another purpose, I was accidentally led to the conclusion that the diamond is a crystal of slow growth, from carbon, first reduced either to a liquid or gaseous state. I inferred this, partly, from the growth of large crystals of other substances, whose full size was not attained in less than from five to eight years time. This theory is less complex than that of Mr. Thiese, of Rochester, and it consists in confining carbonic acid gas in a large strong receiver, and in submitting it to a moderate heat and great pressure for a considerable

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length of time. The oxygen would probably be first thrown down to form ozone; other constituents and spurious carbon would follow, forming a mass at the bottom, upon which the crystalization of pure carbon would take place in due time.

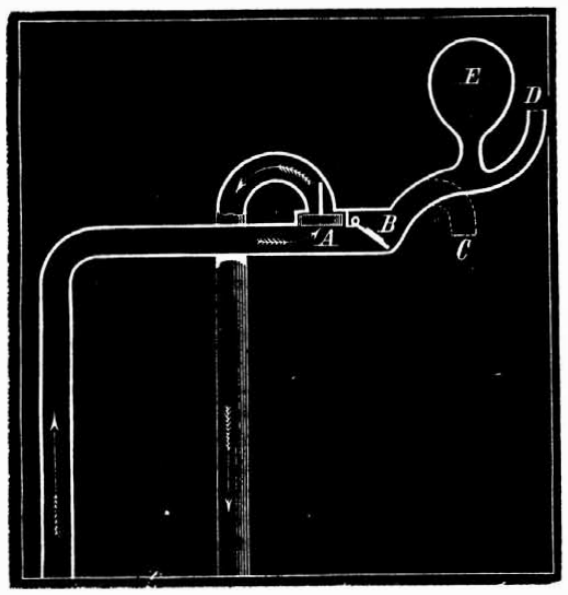
I would suggest the construction of several large and stout glass vessels for the purpose, so that different combinations of chemicals may be submitted to trial, and the result noted from day to day. CHARLES THOMPSON.

St. Albans, Vt.

A Siphon Water Ram.

To the Editor of the Scientific American:

I wish to call attention to an improved siphon hydraulic ram, which, I believe, will elevate water to the hight of thirty feet with considerable less fall than the ordinary ram requires for that elevation.



The engraving herewith given will explain its operation, the arrows indicating the course of the water through the siphon. A is the check valve, and B the outlet valve. Water may be discharged at C, or be carried up by the tube, D, in which case the air chamber, E, will be required.

Gilman, Ill. B. FRESE.

A Flying Machine.

To the Editor of the Scientific American:

Cannot we arouse a little more spirit and inquiry regarding the subject of a practical flying machine, and keep the ball rolling until the aim is accomplished? What think you of this contrivance? (See accompanying illustration.) As here represented, the fireless steam engine is assumed to be used, but the object is rather to show a good arrangement for other parts, aside from the motor.

The horizontal driving shaft passes through the frame of the car, and is made to revolve by means of its cranks, worked by rods from the oscillating cylinders below. At each end of this shaft are beveled gears which actuate the vertical wing shafts, and so rotate the spiral fans.

The arms which support the wing spindles are disconnected at the center of the car (under the canopy) and so arranged upon the car frame that, by means of handles, they are easily and quickly made to revolve, partially and independently above the shaft, so that the gearing may always be in action. The object is to incline the wing shafts, for the purposes of propelling the machine forward or backward, or of turning it around when desired.

By this mode of gearing, the two fan wings always revolve in contrary directions to each other, and each has the same number of revolutions. They are also of the same form and size. When both wing shafts are vertical, the car moves upward; when both are slightly inclined in one and the same direction, the car will not only rise, but also move forward; and a contrary inclination of both wings stops the forward motion. A certain velocity of the wings, when the shafts are vertical or nearly so, as before said, causes the car to rise; a less velocity balances it in the air, neither rising nor falling, and still less allows it to descend gently.

The form of the car can be varied to suit the fancy, and it can be made to carry two or more persons. The legs are supposed to be hinged to the body, and to have stout india rubber straps attached across them, to act like springs, breaking the jar when the machine alights. Should the wings cease to revolve, they will act, with the canopy of the car, as parachutes to break the fall. Indeed, a regular parachute can be made to rise and open above the canopy, and flaps may be placed on the sides of the car, if desired.

The most effective inclination or angle for the blades appears to be about 33° from a horizontal line. The wings need not be very large. When intended to carry the machine and only one man, ten feet diameter for each wing appears to be quite sufficient.

We must not mistake the buoyant power of still air for its capabilities under the quick stroke of a wing. This effect of rapid motion in the wing is well illustrated in birds. A wild duck of quick motion flies with only one square inch of wing to each ounce of its weight; a turkey with only three fourths, robins with four, tame pigeons with three and three quarters, bats twenty, and butterflies from twenty to fifty; and we find generally that large and heavy birds have much less wing space, proportionally, than the smaller ones.

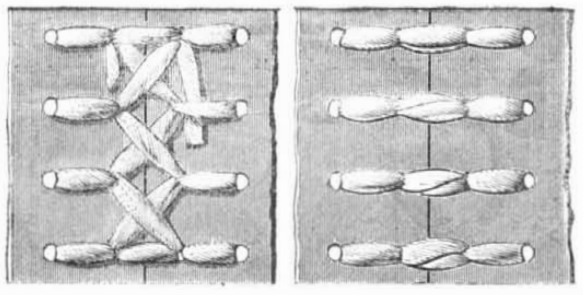
In this machine every desired evolution appears to be provided for. Now what motor shall we use? The whole machine, with all its appliances, can probably be made within a weight of 150 lbs., and at a cost less than that of a good horse. W. D. G.

New York city.

Lacing Belts.

To the Editor of the Scientific American:

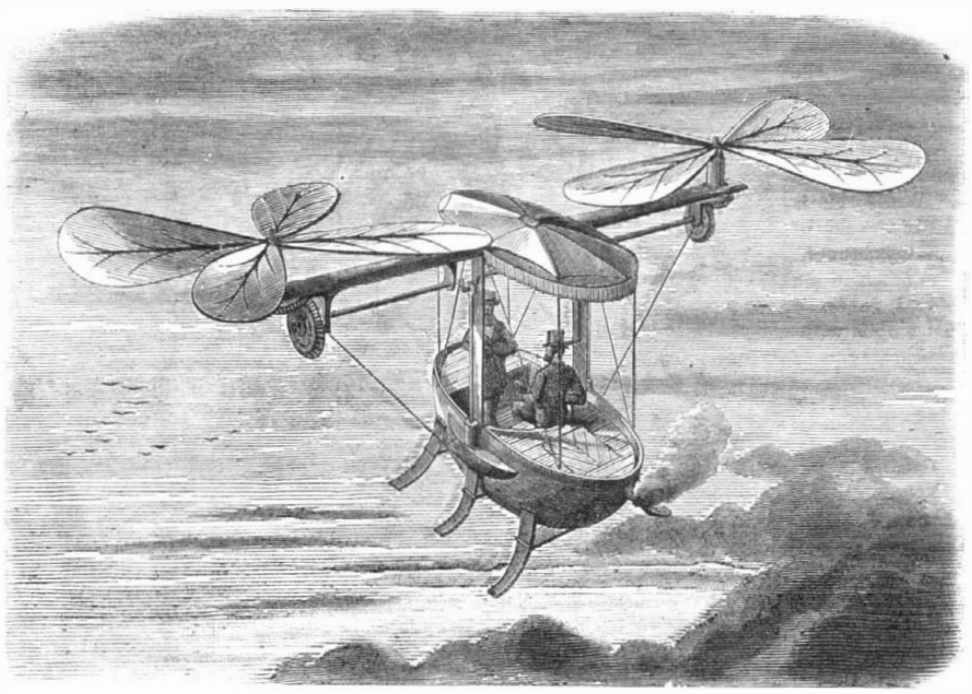
Permit me, through your valuable columns, to give your readers my experience in lacing a belt: Place the ends of the belt together, punch holes as for lacing in the usual way; then punch another row of holes directly behind them, from one to one and a half inches away, and not as large as the ones nearest to the end. Cut a lacing eight times as long as the belt is wide, or the lace may be spliced as soon as one is used up. Commence lacing from the inside of the belt; put the lace through the holes nearest the end and in opposite ends of the belt, beginning at one edge, and draw the lace through, until the ends of the belt are drawn together and the lace is of equal length on the outside of the belt. Pass the ends across, put them down in the contrary way from what they were before, and bring them up through the same holes that you put them through first; then you



have the laces on the outside of the belt. Put the ends of each lace down through the holes directly behind them; but do not draw them down snug until after you put it up through the same hole as before from that side, and draw it all tight. Now we have one set of holes finished, and the lace is on the outside of the belt. Cross the ends, and pass down the first row of holes, and repeat as at first, and the lacing will be exactly similar, with the exception that there will be but two thicknesses of lacing in the place of three, as at the first; for it is most essential to have the edges of the belt laced firmly, lest your belt should run crooked over the pulleys. This way of lacing I have learned from fifteen years' experience, and I freely give it to your readers, for I have received far more valuable information from correspondents of your paper, which I would not be without for anything. CLARENCE MCCOY.

Antioch, Cal.

[Our readers will not fail to see that there is a great advantage in having the lacing on the side next the pulley running lengthwise of the belt, as this method gives less friction on the pulley.—EDS.]



PROPOSED FLYING MACHINE.

New Galvanic Batteries.

To the Editor of the Scientific American:

In addition to the facts in my communication, published on page 277 of your current volume, I wish now to inform you that I have succeeded in making Daniell's and Bunsen's batteries constant and inodorous, by using glycerin instead of water. Thus, in Daniell's battery I put glycerin with sulphuric acid in the copper, and glycerin with sal ammoniac or sulphuric acid in the zinc.

In Bunsen's battery, I use glycerin and sulphuric acid around the zinc, and glycerin and nitric acid around the carbon. I therefore call this latter battery the nitro-glycerin battery. In this battery I use carbon taken from the bottom of a gas retort, cut into convenient slabs, which I find to be better than artificial carbon. I tried cast iron in this battery, but the result was that the iron oxydized very rapidly and covered the zinc. I found also that it is not necessary in using glycerin to amalgamate the zinc.

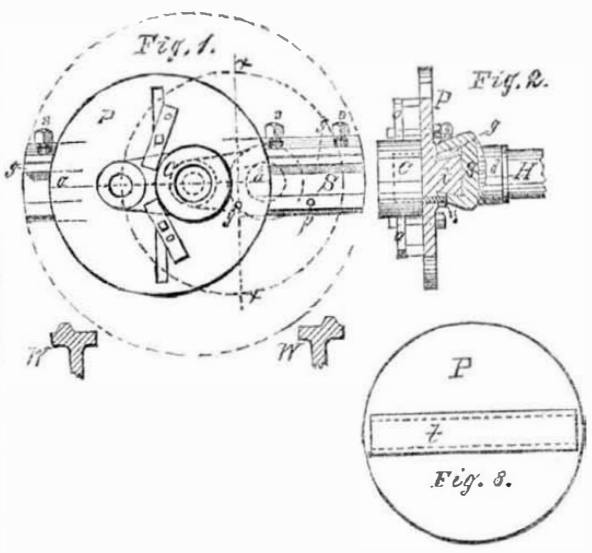
I thus caused the most powerful batteries to be constant.

Milwaukee, Wis. L. BURSTALL.

A Sliding Face Plate.

To the Editor of the Scientific American:

Mr. Rose's recent article on boring the crank calls to mind a sliding faceplate, of which I send a sketch. Fig. 1 is a front view; Fig. 2, a side and sectional view; Fig. 3, back of faceplate, showing dovetail bar, *t*. S is a slide, as long as will swing over the ways, W, hollowed by a dovetailed



longitudinal groove, and provided with a hub, *d*, at the middle, which screws on the spindle, H. P is a faceplate with a bar, *t*, extending nearly across the back, fitted to the slide, S, along which it may be moved. *g* is a bar held against *t*, by screws, *s*, at any desired pressure. C is a crank, strapped to the faceplate, and the latter is moved to a position for boring the main hub; the dotted lines (Fig. 1) show the position for boring the smaller hub. Both hubs are bored and faced at a single chucking; and if the workman is careful not to spring the piece in clamping, the work will be positively in line. It is of no consequence whether the faceplate is crowning or dishing, or whether the slide is square with the spindle; the work will be true. By using a dowel pin, at *y*, and alternately at *p*, cranks may be bored to have exactly the same throw. Eccentrics can be accurately bored and turned at a single chucking.

Its general use will be readily understood by mechanics. All holes bored will be on the line, *a b*, and work must be bedded accordingly.

E. B. WHITMORE.

Rochester, N. Y.

Curious Apples.

To the Editor of the Scientific American:

The curious apple described in your issue of November 21 is simply the effect of abnormal growth, one portion of the fruit developing and ripening sooner than the other. The sweet and sour portions show the contrast between ripe and unripe fruit. By keeping a specimen a sufficient time, this fact will appear. The suture between the parts is also produced by one part having an earlier and larger development.

Splitting a bud could not produce the effect. Even if it could be made to grow, it would only produce on each side a limb bearing fruit according to its kind. Trees of the greening apple are sometimes subject to this unnatural growth of the fruit, and the contrast between the ripe and unripe parts is of course strongly marked.

FLETCHER WILLIAMS.

Newark, N. Y.

Drawing as an Educator.

In referring to the usefulness of the art of drawing, in education, the *Illustrated London News* says: "The school board have taken an important and, we think, very wise step by resolving to introduce the elementary teaching of drawing into the schools. The teaching of drawing confers, as it were, a new sense; it develops perceptions which reading and other branches of education can never reach. To say nothing of the increased pleasure it affords through life, so long as the power of sight endures, it trains precisely those faculties which are most regarded in nearly all mechanical occupations, and it forms, therefore, the basis of most technical education. There are few mechanics who would not be benefited in their work by a knowledge of drawing; while here and there the proposed teaching may stimulate genius that might otherwise remain dormant. The system of teaching adopted in the German *kindergarten* has been recommended and the suggestion deserves consideration."

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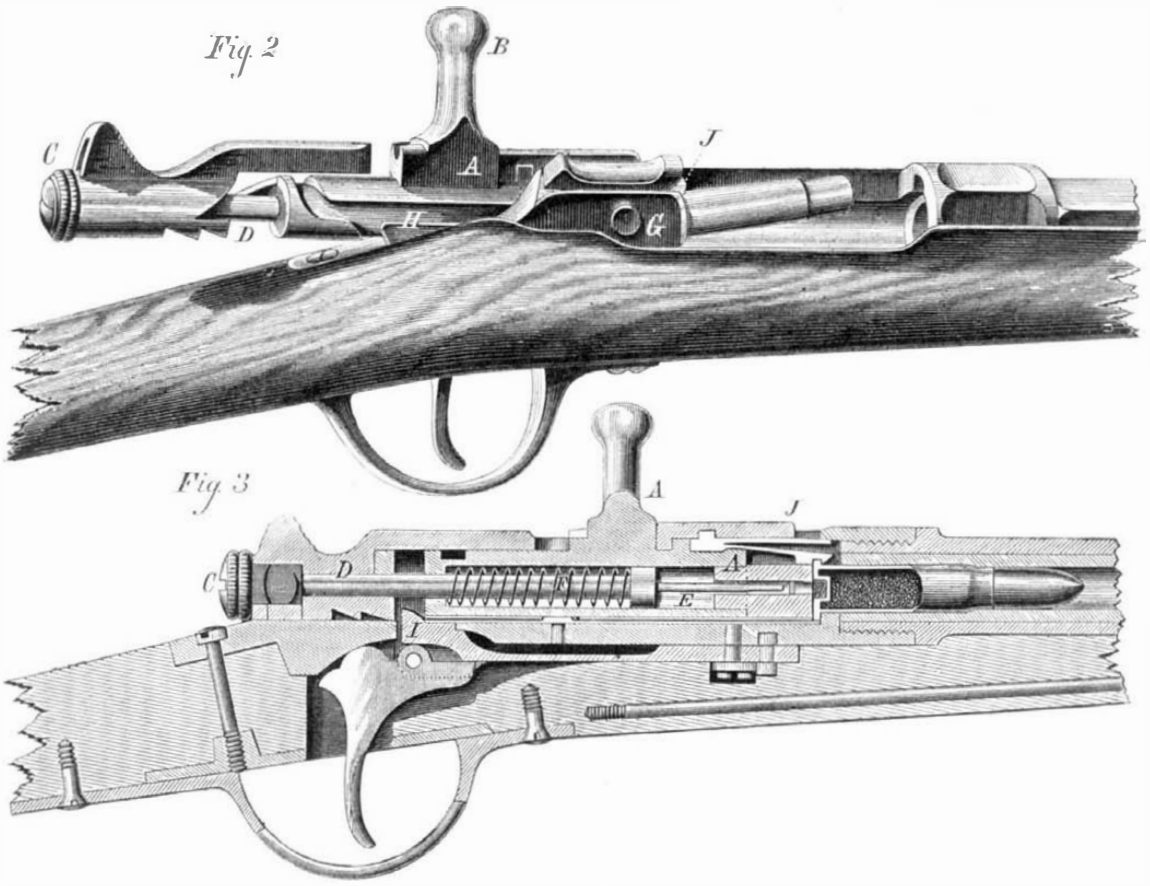
THE NEW FRENCH ARMY GUN.

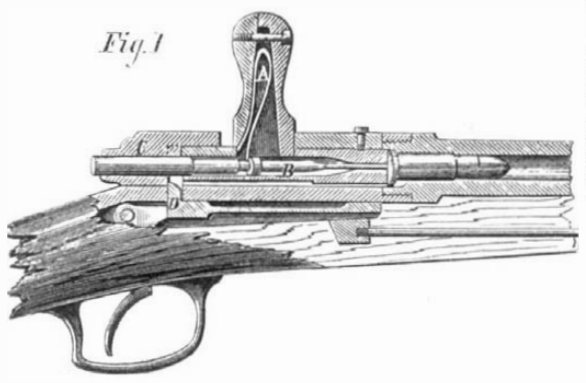
Through the courtesy of a Paris correspondent, we have lately obtained tracings of the official drawings of the new gun, which a board of officers, under the presidency of Marshal Canrobert, adopted, on the 13th of August last, as the weapon with which the army is to be provided. Out of the various designs submitted to the examiners, it appears that but two were favorably regarded. One known as the Beaumont, the invention of a Hollander, found support from four of the eight members of the board, while the remaining half advocated the Gras gun, a French invention. The casting vote of the president, probably influenced somewhat by a patriotic feeling, decided the question in favor of the Frenchman, and so the weapon of which Captain Gras is the reputed inventor is that of the French army of the present and future.

We give an engraving of the Beaumont gun, and also illustrations of the Gras arm, prepared from the tracings above referred to, to enable the reader to draw his own comparison. In the Beaumont (Fig. 1), the spring, A, is contained in the lever of the movable breech piece, and its longer branch exercises a pressure in rear of the needle, B. The dog, C, has, beneath its lower forward portion a helicoidal projection, which, at the firing, lodges in a corresponding recess in the bolt, B. The rotation thus impressed upon the latter causes a pressure against each other of the spiral surfaces, and, consequently, the recoil of the dog and needle, sufficient to bend the spring. All the movable portion is then drawn to the rear, so as to expose the end of the spent cartridge, in order to remove the same, and to introduce a new one. This done, the movable part is brought forward until the stop on the bottom of the dog takes against the trigger catch, at D. The breech lever, which has hitherto been in a horizontal position, is then turned upward, closing the mechanism, when the parts are as shown in our illustration, and the weapon is ready to fire.

From this arm the Gras gun, represented in Figs. 2 and 3 (section in the latter), will be found to present much material difference. Fig. 2 shows the position of parts as the cartridge is being extracted, and Fig. 3 the mechanism just before it is closed together for firing. A A is the movable breech piece operated by the lever, B. C is the dog, at the end of which is a button, to which the rod, D, of the firing pin, E, is attached. F is the coiled spring, which throws the pin forward. For loading the gun, the parts are drawn back as shown in Fig. 2. The cartridge is inserted, and the bolt, A, by the lever, B, is drawn forward. While this is being done, a stop, ●, enters a cam groove, H, in the side of the bolt, A, so that the latter is forced to turn as it is brought forward. In Fig. 3, it will be noticed that the notch on the dog, C, is almost in contact with the spring stop, I, governed by the trigger. By pulling on the latter, this stop is withdrawn, and the needle is thrown forward by its spring, striking and exploding the cartridge. At J is the extractor, the part containing which, though drawn back, does not turn with the movable breech, so that the spring hook always grasps the rim of the cartridge case from above. With this gun, it is stated that 45 shots can be fired in three minutes, effective at a range of 5,120 to 5,440 feet.



THE NEW FRENCH ARMY GUN.

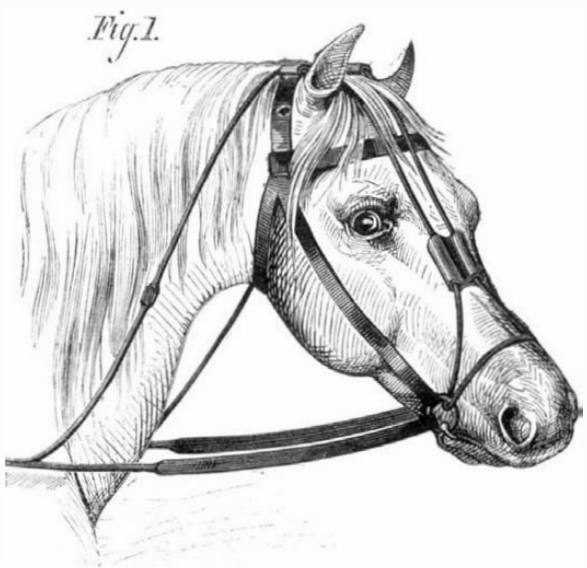


A Wooden Railroad in Michigan.

The tram road of Van Etten, Kaiser, & Co., manufacturers of rough and dressed pine, lumber and lath, at Pinconning, Bay county, Mich., is 11 miles long, and is thus described by the firm: "There are, first, logs laid crosswise, about five or six feet apart. The logs are from 12 to 16 feet in length. Then gains are cut in the logs and flattened timber laid in these gains; this prevents the road from spreading. Our rails are of hard maple. Before spiking the rails down we put ties across the stringers, notching the stringer enough to let the tie down even with the top of it, and spike the tie fast before the rail is laid on. The ties are of 2 inch hemlock plank, from 6 to 12 inches wide; this prevents the stringer from rolling. We would recommend any one who wishes to build a road on the above system to build it as straight as possible. We have some curves in our road, and we have been obliged to dispense with wooden rails on the curves, and lay down iron. We operate our road with locomotive power. Cost of building, without rolling stock, is about $2,000 per mile. The stringers are made from elm, oak, pine, and ash, and are flattened on two sides to 10 inches in thickness."

A BRIDLE AND A BLINDER FOR UNRULY HORSES.

A novel arrangement of horses' head gear has been patented, June 30, 1874, by Mr. R. W. Sanborn, of Rochester, N. Y., by which, it is claimed, the most unruly animal can be constantly kept under control. The device consists of a kind of bridle, as represented in our engraving (Fig. 1), the ends passing over the horse's nose, thence through the bit rings, then through two apertures in a sliding piece, and finally through guide loops on the head stall, the extremities being made fast to the reins. The effect of this is, when a strain is brought upon it, to draw the animal's head up, and, at the same time, to compress the upper jaw between the strap going over the nose and the bit. The amount of power which it is desired to use is regulated by tightening or loosening the bridle in its connection with the reins, so that either a constant strain may be maintained, or the pressure on the jaw applied only when the reins are strongly pulled upon.



By means of the sliding piece just above the nose, the parts of the bridle may be brought together at any desired distance above the ends of the bit. By thus changing the adjustment of the bridle, its action on the animal may be varied as desired.

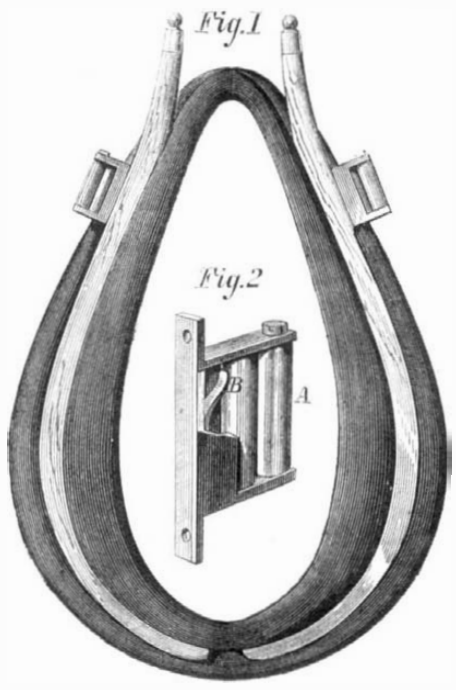
The second invention, which is represented in Fig. 2, is designed to prevent horses turned out to pasture from jumping fences and so running away. It consists of a strap which buckles around the horse's head just below the eyes, to the front part of which the blinder, in shape concaved upon the arc of a circle, is secured. This is further supported by the short strap shown leading to the edge of the blinder from the top of the animal's head.

As will be readily understood, this blinder is not for travel. While it admits plenty of light and air to the horse's eyes, it, however, stops the animal's view, both in front and at the sides, so that, as he approaches a fence, he is able to see neither the bars nor the ground beyond, and consequently does not attempt the leap. The device is easily detachable, and may be used in connection with an ordinary halter or bridle. It was patented through the Scientific American Patent Agency, June 23, 1874, by Mr. John W. Kennedy, of Central Village, Windham county, Conn.

SMITH'S IMPROVED REIN HOLDER.

This invention is intended to prevent the fastening of the reins to the bridle in a twisted condition, also to keep the former from falling under the horse's feet when unattached to the bit, or from dropping under the tongue of the vehicle.

The device is represented in our illustration secured to the harness, and also separately in Fig. 2. It consists of a simple metal casing, having one pivoted roller, A, and another, not pivoted, but forced in close contact with the first by means of a spring, B. The rein is passed through between the rollers, and thus supported.



On work harness, the rein holder may be made pendent to conform to the position of the reins. On light harness it may take the place of the terret, and thus, it is claimed, be of greater service than a rein holder secured to the carriage, since it keeps the reins up in front of the animal so that he cannot get his fore feet over them. At the same time the reins, when thrown over the dashboard, are less liable to get under the horse's feet and tail. The inventor points out that, in similar devices which keep the reins taut, the horse is apt to put his tail over, and so, pulling on the lines, to cause himself to back, thus breaking the hitching strap, a difficulty evidently obviated by the present invention.

The entire right is for sale; or, if not sold within six months, proposals for manufacturing on royalty are invited. Patented August 25, 1874, by Mr. A. K. Smith, of Nebraska, Pickaway county, Ohio, who may be addressed for further information.

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THE INDOOR GARDEN AND THE SHRUBBERY.

The numerous lovers of flowers are now turning their attention indoors; and the conservatory and the window sill again receive the chief share of consideration. We introduce to notice an exquisite flowering plant, easily cultivated in a hothouse. It is called the lemon-scented gardenia, and is especially suited for bouquets, and for any purpose for which choice cut flowers are in demand. It is readily propagated by means of cuttings inserted in a genial bottom heat, and young plants, if liberally treated, seldom fail to flower the first year. A rich peaty soil suits it admirably; and during the growing season, it requires copious supplies of moisture, both at the roots and in the atmosphere. Apart from its attraction as a decorative stove or warm greenhouse plant, its flowers are extremely useful for buttonholes, as they can easily be mounted on thin wires, either singly or in clusters. Like other gardenias, this species is very liable to be infested with insects, which must be carefully looked after. Its pearly sweet-scented flowers, which are produced in winter, form a good substitute for orange blossom, and on that account alone it deserves attention. It is a native of Southern Africa.

The flowering bulbs which decorate our mantelpieces are being much inquired for. Among the best for indoor growth are narcissus (such as the paper-white and *soleil d'or*), hyacinths, snowdrops, crocuses, and tulips. All these may be potted in a light compost, and the two first mentioned grown well in glasses of water. A more effective method of displaying their beauties is the use of a perforated vase, as shown in our engraving. It is pierced with holes, opposite each of which a flower bulb is placed; and the intervening spaces are filled with compost. Some use moist sphagnum (moss) in place of soil; and if the bulbs are well ripened, it answers nearly equally well. A hyacinth bulb, planted at the top, finishes off the arrangement in a pleasing and artistic manner.

Hyacinth and narcissus bulbs may also be placed in common hyacinth glasses, filled nearly full of tepid water. Care should be taken to prevent the base of the bulbs touching the water below; and if a space of about half an inch is left between, the roots, attracted by the moisture, soon protrude from the base of the bulb, and find their way down inside the glass. If this point is not duly attended to, it often results in the bulbs rotting away at the base, and this is especially the case if they are unripened or loose in texture. Few early flowering plants give greater satisfaction to the amateur than these, as they are so easily grown, and flower so quickly after being potted.

In addition to those mentioned above, flowering bulbs of both the belladonna and Guernsey lilies, if carefully potted in any light rich soil, will flower in a week or two, and will keep the window gay until hyacinths and narcissus develop their delicate, wax-like, richly perfumed flowers.

Leaving the greenhouse and parlor, we come to a very hardy shrub, recently brought from Japan, and exhibited in Paris; it is the *rhodotypus kerrioides*, and is shown in our third illustration. The flowers are pure white, and are abundantly produced, the plant being about three feet high. It is easily propagated by cuttings, and by separation of the suckers. In favorable seasons, it begins to flower about the middle of April, and continues to bloom throughout the month of May. We know of no subject, says the English *Garden*, from which we select the illustrations, more worthy of a place in the flower garden or choice shrubbery.

PERFORATED VASE FOR FLOWERING BULBS.

THE LEMON-SCENTED GARDENIA, AND BLOOM (natural size).

The Java Agricultural and Industrial Exhibition.

There will shortly be no corner of the world which the industrial exhibition idea has not reached. The Dutch colony of Java announces her second "Exhibition of the Works of Certain Industries of all Nations," to be opened at Diocjakarta, in April, 1875. The colonies of Holland in the great eastern archipelago are very extensive, and contain a population of 30,000,000. The demand for machinery, especially agricultural implements, is large, and the natural productions of the islands are very numerous and valuable. The agriculture of Java is excellent, showing much of the care in tillage and irrigation which distinguishes the Dutch people in their own country.

The managers of the Exhibition especially wish to introduce to the people of these islands: Labor-saving tools, implements, and machinery of every description and for every purpose, for use and appliance in industrial, agricultural, or domestic pursuits; as well as articles for general use, either for wear or food, adapted to the requirements of a people of thrifty and frugal habits, "containing among them numerous native and European planters and dignitaries, people of distinction and of cultivated and refined tastes."

It is worth knowing that books, engines, machinery of all kinds, and metals (raw and manufactured) are admitted to these islands free of duty; while textile manufactures, leather, clocks, domestic wares, and provisions pay a duty of only 6 per cent *ad valorem*.

Mr. L. W. Morris, of 50 Broadway, New York city, is the agent for the United States, and will be happy to give detailed information.

The Glace or Enameled Photograph.

The glass upon which the enameling is to be done must be scrupulously clean. Plate glass, free from scratches, is the best, although good photograph glass will do if not scratched. Blisters in the glass hurt nothing. After it is thoroughly clean, sprinkle over it, by means of a five cent pepper box, powdered talc (or French chalk), and with a tuft of cotton rub in a circular motion(carefully going over the whole surface) until no trace of the chalk is perceptible. Do not rub heavily. The chalk gives a surface to the glass that assists in the lifting the enameled print from it. Now flow the plate with collodion made as follows, namely,ether, 4½ ounces, alcohol 3½ ounces, cotton to thicken (say from 5 to 7 grains to the ounce of solution),and 24 drops (or minims) of castor oil. When this flow is dry, apply the prints face down, after immersing them in a gelatin solution made as follows: Coxe's gelatin 1 ounce, water 8 ounces, glycerin 50 drops. Add the gelatin and glycerin to the water, and let it stand over night,when it will be ready for use after filtering, which can be done by warming sufficiently to make the solution limpid. Allow the prints to remain in this solution aoout five minutes before laying them on the collodionized glass, and then pass a gum roller lightly over them to press them tightly to the glass, and also to remove the surplus gelatin. After the prints are nearly dry they are ready for the mounts. For this purpose, light Bristol board is best. Use the gelatin solution for mounting, and mount on the glass as the prints lay. The whole thing must be perfectly dry before an attempt is made to remove them from the glass. When they are dry, run a knife blade around the edge to start them up; and if thoroughly dry and the work properly done,they will come off all right. "I forgot to say, in the proper place, that it is a good idea to lay upon the back, after the mounts have been applied, a weight of some kind, say a heavy piece of glass, which should remain there for an hour at least. This assists in securing a complete contact to the print. At the end of an hour remove the weight and leave the print, back up, until perfectly dry all through. Sometimes they start off without help, which shows perfect success. Rememeber that careful manipulation is the only surety for success. A little experience will enable any one to perform this operation well."—*Philadelphia Photographer.*

Carrots.

In Belg um and other continental countries, the carrot has been grown as a field crop for a longer time, and to a much greater extent, than in Britain. In the year 1765, the attention of the Society for the Encouragement of Arts, etc., was directed to this branch of husbandry, and, in consequence, an account of the culture of carrots and the uses to which they may be applied was published by Robert Billing, a farmer in Norfolk, who states that he obtained, from twenty and a half acres, five hundred and ten loads of this root, which he found equal in use and effect to a thousand loads of turnips, or three hundred loads of hay. Some of them measured two feet in length, and from twelve to fourteen inches round. Horses are remarkably fond of carrots, and when mixed with oats they form very good food for them. The efficacy of these roots in preserving and restoring the wind of horses had, it is said, been partially known in Suffolk, where carrots were administered as a secret specific for the complaint long previously to their being commonly applied as food for that animal. Carrots are equally beneficial as nourishment for cows, sheep, and swine. It was stated some years since that at Purlington, in Yorkshire, the stock of a farm, consisting of twenty working horses, four bullocks, and six milch cows, were fed from the end of September to the beginning of May on the carrots produced from three acres of land. The animals, during the whole of that period, lived on these roots, with the addition of only a very small quantity of hay.

Carrots contain a large amount of water, 86 parts in 100 lbs. Their most distinguished dietetical substance is sugar, of which they possess nearly 6½ per cent. Starch is also found in small quantities, with a small portion of albumen. The ancients used the seed both of the wild and cultivated carrot as an internal medicine against the bite of serpents; they also gave it to animals that had been stung by them.

Dr. James says that carrots strengthen and fatten the body, and are very proper food for consumptive persons. The root of the garden carrot is much used as a poultice for cancers, on account of its antiseptic qualities. In some parts of Europe a spirit is distilled from this vegetable. The abundance of sugar contained in the roots is readily converted into alcohol. About 160 lbs. of the crushed roots are required to yield one gallon of spirit. Sugar has been obtained from them; but notwithstanding the large amount existing in them, the manufacture has not been found profitable. In Germany, a substitute for coffee has been made of the roots chopped up into small pieces and partially carbonized by roasting. A dye similar to wood has been obtained from them.

Parkinson, botanist to James I., tells us that ladies of his time used to decorate their hats or heads with the leaves of the wild carrot, which in the autumn are exceedingly beautiful. This, says Phillips, would rather show the simplicity of our ancestors than their want of taste; as we have seen ladies' dresses trimmed with the curled leaves of the garden parsley, which were not more admired for their novelty than for the elegance they displayed.

If in winter a section be cut from the end of the thick part of the root, and this be placed in a shallow vessel con-

RHODOTYPUS KERRIOIDES.

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taining water, young and delicate leaves are developed, forming a radiated tuft, the graceful and verdant appearance of which makes it a pleasing ornament to a room in that season when any semblance of vegetation is a welcome relief to the eye. Flowers may be cut out of large carrots that closely resemble ranunculuses, without the least aid of coloring.—*Hompden G. Glasspole, in Science Gossip.*

PATENT OFFICE YEARLY REPORT.

The Annual Report of the late Commissioner of Patents, General M. D. Leggett, was recently submitted to the Secretary of the Interior, and we here give an abstract.

The following table shows the receipts, expenditures, and business of the Office during the year from October 1, 1873, to September 30, 1874:

MONEYS RECEIVED.

Amounts received for applications for patents, extensions, caveats, disclaimers, appeals, and trade marks	$645,480
For caveats	47,923
For recording assignments	18,152
For subscriptions to *Official Gazette*	8,913
For registration of labels (since August, 1874)	642
Total	$721,110

MONEYS EXPENDED.

Amount paid for salaries	$484,694
Amount paid for photographing back issues	36,223
Amount paid for photographing current issues	46,313
Amount paid for illustrations for *Gazette*	35,292
Amount paid for contingent expenses	83,082
Amount paid for tracings	8,668
Total	$694,072
Excess of receipts over expenditures	27,038

STATEMENT OF THE BUSINESS OF THE OFFICE.

Number of applications for patents from Oct. 1, 1873 to Sept. 30, 1874	21,077
Number of patents issued, including reissues and designs	13,545
Applications for extensions of patents	229
Patents extended	308
Caveats filed	3,129
Patents expired	5,287
Patents allowed but not issued for want of the final fee	2,680
Applications for registration of trade marks	589
Trade marks registered	524
Application for registration of labels	107
Labels registered (since August, 1874)	50

The number of applications and of patents granted is a slight increase upon those of the preceding year.

The prompt publication of abstracts of patents issued has improved the character of such applications, thereby warranting the issue of patents for a larger proportion than could otherwise be granted. Before the establishment of the Patent Office *Gazette*, it was from two and a half to three years after the issue of a patent before the public had any means of knowing of its contents. Consequently there would be in existence from twenty-five to thirty thousand patents, the substance of which was sealed to all except their owners; hence applications were constantly being made to patent devices which had been previously patented by others.

REPRODUCTION OF DRAWINGS OF OLD PATENTS.

The importance of printing the older existing patents is illustrated and explained.

No one thing in the Office is needed more than a thorough digest, published in convenient form, of each one of the 145 classes of inventions, as represented in the Patent Office. The number of applications on file in the Office is nearly 300,000. To look back over these applications and the devices represented by them, in considering new applications, is a work the vastness of which need not be further explained to be fully understood. The digest referred to should, in a classified form, briefly describe each one of these, in such a manner that they would become sufficient in the examination of cases, without constantly resorting to the files. If correct and thorough digests of this character, from the organization of the Office down to the present time, were in the hands of the examiners, inventors, and attorneys practising before the Office, the labors of the examining corps would be 25 per cent less than at present, and would bear a considerable reduction, unless the number of applicants largely increased. In many of these classes a sufficient number of volumes could be sold to reimburse the government for the entire expense of their publication. Such digests would, therefore, be an economical investment, saving money to the Treasury, and securing far greater accuracy in examining applications and the granting of patents. "To this matter, therefore, I would earnestly request the Secretary to give special thought and attention. A special appropriation would be needed for the purpose."

MORE ROOM NEEDED.

Additional room is required for the use of the Patent Office. It is utterly impossible to properly transact the work of the Office in the narrow quarters granted to it. Eight additional rooms are needed immediately. The report pays a just tribute to the character of the persons employed in the Patent Office, and regrets that the salaries paid are not sufficiently large to retain the best men in the service, who are constantly leaving it for more lucrative employment.

THE new American built steamer Tokio has made a successful first voyage, from New York to Aspinwall. Time, seven days and fifteen hours, being an average of eleven knots an hour, on thirty-nine tuns of coal per day, with fifty pounds of steam and six boilers. There was no occasion to stop the engine during the entire trip of two thousand miles.

Odors.

Among mineral substances, few solids, but quite a number of liquid and gases, are endowed with more or less powerful scents, in most cases not very pleasant ones, and usually characteristic. Those odors belong to simple substances, such as chlorine, bromine, and iodine; to acids, as hydrochloric and hydrocyanic acid; to carburets of hydrogen, as those of petroleum; to alkaline substances, ammonia, for instance, etc. The odors observable among minerals may almost all be referred either to hydrocarbonic or hydrosulphuric gases, or to various solid and liquid acids produced by the decomposition of fats, or to peculiar principles secreted by glands, such as musk, ambergris, civet, and the like.

The odor of plants is due to principles very unequally distributed throughout their different organs; some solid, as resins and balsams, others which are liquid, and known by the name of essences or essential oils. In most cases the essence is concentrated in the flower, as occurs with the rose and the violet. In other plants, as in bent grass and Florence iris, only the root is fragrant. In cedar and sandal wood, it is the wood that is so; in mint and patchouli, the leaves; in the Tonquin bean, the seed; in cinnamon, it is the bark which is the seat of the odorous principle. Some plants have several quite distinct fragrances. Thus the orange has three: that of the leaves and fruit, which gives the essence known by the name of *petit grain*; that of the flowers, which furnishes neroli; and again the rind of the fruit, from which essence of Portugal is extracted.

What, now, is the chemical nature of the odorous principles in plants? The chemistry of today reduces almost all of them to three categories of well ascertained substances: hydrocarburets, aldehydes, and ethers. We will endeavor to give a clear account of the constitution of these three kinds of substances, and to mark their place in the register of Science. The hydrocarburets are simple combinations of carbon and hydrogen, as, for instance, the petroleum oils. They represent the simple compounds of organic chemistry. As to aldehydes and ethers, their composition is rather more complex; besides carbon and hydrogen, they contain oxygen. Every one knows what chemists mean by an alcohol; it is a definite combination of hydrogen, carbon, and oxygen, neither acid nor alkaline, which may be regarded as the result of the union of a hydrocarburet with the elements of water. Common alcohol, or spirits of wine, is the type of the most important series of alcohols, that of the mono atomic alcohols. Chemists represent it by the formula C^2H^6O, to indicate that a molecule of it arises from the union of two atoms of carbon with six atoms of hydrogen and one of oxygen. Independently of the alcohols, which are of great number and varying complexity, organic chemistry recognizes another class of bodies, of which vinegar is the type, and which receive the name of organic acids, to mark their resemblance to mineral acids, such as oil of vitriol or aquafortis. Now, every alcohol, on losing a certain amount of hydrogen, gives rise to a new body, which is called an aldehyde; and every alcohol, on combining with an acid, produces what is called an ether. These rapid details allow us to understand precisely the chemical character of the essences or essential oils which plants elaborate within their delicate tissues. Except a small number among them which contain sulphur, as the essences of the family of crucifers, they all present the same qualitative composition—carbon and hydrogen, with or without oxygen. Between one and another of them merely the proportion of these three composing elements varies, by regular gradations, but so as always to correspond either to a hydrocarburet, or to an aldehyde, or to an ether. In this case, as in almost the whole of organic chemistry, everything is in the quantity of the composing elements. The quality is of so little importance to Nature that, while following always the same laws and constantly using the same materials, she can, by merely changing the ponderable relations of the latter, produce, by myriads of various combinations, myriads of substances which have no resemblance to each other. The strange powers of the elements and the mysterious forces concealed in matter make themselves known to us in a still more remarkable phenomenon, to which the name of *isomery* is given. Two bodies, thoroughly unlike as regards their properties, may present absolutely the same chemical composition with respect to quality and quantity of elements. "But in what do they differ?" it may be asked. They differ in the arrangement of their molecules. Coal and the diamond are identical in substance. Common phosphorus and amorphous phosphorus are one and the same in substance. Now, the odorous principles of plants offer some exceedingly curious cases of isomery. Thus the essence of turpentine, the essence of lemon, that of bergamot, of neroli, of juniper, of savin, of lavender, of cubebs, of pepper, and of gillyflower are isomeric bodies, that is, they all have the same chemical composition. Subjected to analysis, all these products yield identical substances in identical proportions, that is, for each molecule of essence, ten atoms of carbon and sixteen atoms of oxygen, as denoted by their common formula, $C^{10}O^{16}$. We see how these facts as to isomery prove that the qualities of bodies depend far more on the arrangement and the inner movements of their minute particles, never to be reached by our search, than on the nature of their matter itself; and they show, too, how far we still are from having penetrated to the first conditions of the action and forces of substances.

But chemistry has not stopped short with ascertaining the inmost composition of these substances; it has succeeded in reproducing quite a number of them artificially; and the compounds thus manufactured, wholly from elements, in laboratories, are absolutely identical with the products extracted from plants. The speculations of theory on the arrangements of atoms, sometimes condemned as useless, do not merely aid in giving us a clearer comprehension of natural laws, which is something of itself, but they do more, as real instances prove: they often give us the key to brilliant and valuable inventions. An Italian chemist, who was then employed in Paris, Piria, in 1838, was the first who imitated by art a natural aromatic principle. By means of reactions suggested by theory, he prepared a salicilic aldehyde, which turned out to be the essence of meadowsweet, so delicate and subtile in its odor. A few years later, in 1843, Cahours discovered methyl-salicilic ether, and showed that it is identical with the essence of wintergreen. A year after, Wertheim composed essence of mustard, while believing himself to be making only allyl-sulphocyanic ether. These discoveries produced a sensation. Nowadays the chemist possesses the means of creating many other natural essences. Common camphor, essence of bitter almonds, that of cummin and of cinnamon, which are aldehydes, as we have seen, may be prepared without camphor leaves or almonds, without cummin or cinnamon. Besides these ethers and aldehydes, whose identity with essences of vegetable origin has been proved, there exist, among the new bodies known to chemistry, a certain number of products formed by the union of common alcohol or amylic alcohol with different acids, that is to say, of ethers, which have aromatic odors more or less resembling those of some fruits, but as to which it can not yet be affirmed that the odors are due to the same principles in both cases. However this may be, perfumers and confectioners, more industrious and wide-awake than chemists, have immediately made good use of many of these properties.

Artificial aromatic oils made their first appearance at the World's Fair of London in 1851. There was there exhibited a pear oil, diffusing a pleasant smell like that of a jargonel, and employed to give an aroma to *bonbons*. This product is nothing else than a solution of amylacetic ether in alcohol. Apple oil was exhibited beside the pear oil, having the fragrance of the best rennets, and produced by dissolving amyl-valeric ether in alcohol. The commonest essence was that of pineapple, which is nothing else than ordinary butyric ether. There was observed, too, an essence of cognac, or grape oil, used to impart to poor brandies the highly prized aroma of cognac. The product which was then, and still is, the most important article of manufacture, is the essence of mirbane, which very closely resembles in its odor that of bitter almonds, and which commerce very often substitutes for the latter. Essence of mirbane is nothing else than nitrobenzine, which results from the action of nitric acid on benzine. Benzine, in turn, is met with among the products of distillation of tar, which also yield the substances used in preparing those beautiful colors called aniline.—*F. Papillon, in Revue Scientifique.*

SCIENTIFIC AND PRACTICAL INFORMATION.

OCCLUSION OF GASES BY IRON WIRE.

In drawing certain numbers of iron wire, it often becomes necessary, in order to continue the use of the drawing bench, to anneal the iron. This is done in a hermetically closed receptacle, so as to avoid, as much as possible, the oxidation of the metal. In spite of this precaution, however, the latter becomes covered with an ochraceous film, which it is necessary to remove by an acidulated bath. It frequently happens, however, that, subsequent to this process, the metal becomes so brittle as to render its further drawing impossible. M. Seroz, engineer of the *Société des Forges de La Franche Comté*, has examined into this phenomenon, and finds that the iron becomes charged with a condensed gas. On breaking the wire under water in a test tube, inflammable bubbles were generated, which detonated in the air. The exact nature of the gas has not yet been decided, nor that of its direct action upon the metal; but it is believed to be either hydrogen or carbonic oxide.

THE EUCALYPTUS GLOBULUS.

In addition to its remarkable properties as preventer of miasmatic fevers, Dr. Behr, of San Francisco, Cal., states that he has been recently informed by an Australian correspondent that the wood of this tree made most excellent shingles, by reason of its non-inflammable characteristics. It was a common joke in Australia to hand new comers an ember, from the fireplace, of this wood, by which to light their pipes. It would go out as soon as drawn from the fire. Made into shingles, it furnishes a first rate fireproof material for buildings.

THE ORIGIN OF GUANO.

Dr. Habel, who has devoted several years to the exploration of guano islands and the microscopic study of the fertilizer, has recently arrived at the conclusion that the material is not the dejection of sea birds, as ordinarily supposed. He has obtained an insoluble residue after chemical treatment, composed of fossil sponge and marine plants and animalculæ. He thinks, therefore, that guano results from the accumulation of fossil remains, of which the organic matter has been transformed into a nitrogenized substance, while the mineral portion has remained intact.

COOKING OATMEAL.—W. says: One reason why oatmeal is not more generally used as food is that, in the way in which it is usually cooked, it requires constant stirring, which takes a good deal of time and attention. If, after the porridge is mixed, that is, as soon as the oatmeal is stirred into the boiling water, the cover is put on and the tin saucepan containing it placed in another pot of boiling water on the stove, and the water let boil, good oatmeal porridge will be made, without the least danger of its being scorched.

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A Dog on the Witness Stand.

The Richmond, Va., *Enquirer* states that a Mr. Spears was recently before the police court in that city, charged with keeping a vicious dog, and the animal was ordered to be killed. Subsequently, however, the execution of the sentence was suspended, as the evidence upon which he was convicted was *ex parte*, and a new trial granted. When the case came up again, a large number of persons testified as to the good character of the dog, and the whole matter resolved itself into the fact that he had scared the gentleman, who complained of his attacking him, by rough play. Nevertheless, to make assurance doubly sure, at the request of his master, the dog was put upon the stand to testify in his own case. On being asked if he would bite any one, he uttered a peculiar noise and shook his head. He was then asked if he would bite if his master set him on, and replied in the affirmative by nodding his head and barking. When asked if he would bite the Court, he replied in the negative. Several other questions were asked him, and his answers and actions exhibited the greatest intelligence. It is needless to say that he was honorably acquitted.

Resharpening Files.

Well worn files are first carefully cleaned with hot water and soda; they are then placed in connection with the positive pole of a battery, in a bath composed of 40 parts of sulphuric acid and 1,000 parts of water. The negative is formed of a copper spiral, surrounding the files but not touching them; the coil terminates in a wire which rises toward the surface. This arrangement is the result of practical experience. When the files have been in the bath ten minutes, they are taken out, washed, and dried, when the whole of the hollows will be found to have been attacked in a very sensible manner; but should the effect not be sufficient, they are replaced in the bath for the same period as before. Sometimes two operations are necessary, but seldom more. The files, thus treated, are to all appearances like new ones, and are said to be good for 60 hours' work. M. Werdermann employs twelve medium Bunsen elements for his batteries.

New Lighthouses.

A Baltimore firm, under contract with the government, have in course of construction two lighthouses, one of which is destined for Hunting Island, and the other for Morris Island, South Carolina. The one for Hunting Island is entirely of cast iron, and is one hundred and thirty-six feet high and twenty-seven feet in diameter. The one for Morris Island will be one hundred and fifty feet high; the lantern brackets, the gallery, and the lantern are of cast iron, the tower being of brick. The roofs of both the lighthouses are of copper, and each is to be supplied with a spiral stairway.

E. A. says (in commenting on the following statement in our recent articles on "Dentistry": "The teeth may possibly be removed by patiently sawing and cutting the vulcanite away from the pins"): Teeth can be easily and quickly removed by holding them in a spirit lamp until the vulcanite is softened a little around the pins, and the teeth pushed off, using a cloth to protect the hand; but they will come off entirely clean and in much less time than they can be filed, to say nothing of the cost of the teeth.

Recent American and Foreign Patents.

Improved Car Coupling.

Richard Hopkins, Frostburg, Md.—The coupling is pivoted loosely to the lateral front piece of a frame, which is pivoted by arms to staples of the drawhead. The arms of a rod frame swing along the sides of the drawhead, and carry a bottom piece, which extends across the under side of the drawhead, and defines the extent of motion in raising the pin for uncoupling, and also weights the same, to cause the dropping of the coupling pin after the uncoupling mechanism is released. The rod frame is hung to hook-shaped levers, which are pivoted to the car frame, and connected by elbow-shaped extensions to the forward projecting lever. The device is operated at the top of the car by a lateral crank rod and lever connection, with a crank shaft and wheel supported in a top frame.

Improved Adjustable Bed.

Albert F. Supplee, Nelsonville, O.—This is a mattress-supporting frame divided in the middle longitudinally; also divided in three sections transversely, and hinged together, and supported by springs upon two middle supports and two end supports. The whole is so arranged on springs and provided with adjusting levers that either end or side of the bed may be raised and supported higher than the opposite side or end.

Improved Box and Bale Hook.

John W. Knight, Galveston, Texas.—This invention consists of a guard or shield of leather or equivalent material, combined with the handle and shank of the hook used for turning or otherwise handling bales and boxes, to prevent the hands from rubbing or pressing against the bale or box, and thus becoming injured. The guard is so applied to the hook that (when, by lifting the box or bale, the hand is pressed toward the said box or bale) it will be interposed to protect the hand from the rough surface, as well as from any accidentally projecting corners, nails, ors crews.

Improved Book-Supporting Attachment for Tables.

William H. Patterson and Ole Swensen, Cresco, Iowa.—A spindle holds the book holder directly in front of the writer. The book holder is adjustable along the bracket by a slotted foot and a binding screw. A lamp holder is held so as to throw the light of the lamp on the book on the holder to be copied from, as well as the one on the table to be written in. A couple of weighted arms are jointed to the book holder, hanging down in front of it, so that the weights will rest on the book and keep it open. The bracket can be shifted around the stand in case it may be wanted to do so, and it can be taken off and put on readily for convenience in adjusting the parts. An inkstand holder is also provided.

Operating Steam Engines by Compressed Air.

Jacob B. Van Dyne, Louisville, Ky.—This invention relates to a new method of charging steam boilers with a compressed medium of air or gas for instantaneous use, and is more particularly applicable to the boilers of steam fire engines. It consists in admitting a high pressure of air or gas into the boiler above the water when required, and operating the engine by the compressed medium while steam is being generated, the compressed medium furnishing a motive power which is instantaneously available, and which, owing to the expansion of the air or gas by the heat, is sufficiently continuous to run the engine until reenforced by the steam, without any intermission.

Improved Bale Tie.

Henry B. Jones, Burton, Texas.—The key consists of a head, a short shank, and a radially projecting bit, having sharp corners to clutch the fibers of the bale. The key is inserted in keyhole slots in the ends of the hoop.

Improved Grain Binder.

James McNeal, Chauncey, Ill.—This invention consists of a pair of gripping arms, in combination with a sewing machine needle and shuttle and looping hooks, so contrived that they gripe the gavel, compress it, and pass it across the needle hole into a bight of the twine, and hold it while the twine is being tied by the sewing machine devices.

Improved Bed Lounge.

Ferdinand Braun, New York city.—This sofa bed is readily thrown into open or folded position for use as bed or sofa or lounge, all the parts being firmly and securely connected. A hinged section has a longitudinal sideboard hinged thereto and a fastening rod pivoted to the board, with a hinged top piece for retaining the same rigidly in open inclined position.

Improved Horse Hay Rake.

Solon H. Bushnell, Fairport, N. Y.—Collars placed upon an axle are secured adjustably in place by set screws which pass in through projections. Upon the other side of the collars are formed projections to receive the ends of the rake teeth which are held by set screws which pass in through the side of the said projections, and press against the said teeth. By suitable mechanism the draft strain may be made to hold the rake teeth down to the ground with more or less force, as circumstances may require; and other apparatus is provided which, as the rake teeth are raised to discharge the collected hay, prevents the hay from being raised by and with the rake teeth, and causes the hay to be promptly dropped, thus preventing the teeth from becoming clogged and the hay from being scattered.

Improved Wheel for Vehicles.

George Cornwall, Plainfield, N. J.—The rim of sheet metal has a groove in the face of half a circle; also sockets upon the inner periphery for the reception of the spokes. The last screw deep into the hub, so as to enter the socket, and then screw out again sufficiently to screw them in the rim. The tyre of the wheel is made of round vulcanized rubber, nicely fitting in the groove.

Improved Dust Cap for Watch Regulators.

Wenzel H. B. Schmied, Napa, Cal.—This is a dust cap arranged to cover and shield the hair spring and regulator hand, and the more delicate portions of the watch movement. It is a metallic frame, enclosing a transparent plate, and is tightly fitted down on the plate and over the bridge, and fastened by square-headed screws. These screws have each an eccentric washer under the head, which, when the cap is fastened, are turned by means of a watch key on the narrow flange of the cap frame, which securely holds the cap in place.

Improved Chemical Fire Extinguisher.

Jacob B. Van Dyne, Louisville, Ky.—This invention relates to certain improvements in chemical fire extinguishers, and consists in the combination of two invertible fire extinguishers, supported upon wheels, and connected with a common discharge pipe by intermediate flexible pipes provided with detachable caps. It consists further in the combination of a swiveled screw rod, a frame, and a nut for the purpose of forming a stopper for the acid vessel, and also in the combination of a detachably locked acid vessel with an acid vessel holder, permanently attached to the shell of the extinguisher.

Improved Plow.

August Ihringer, Calvert, Texas.—This invention relates to means whereby the beam of a plow may be elevated or depressed at the front end, according to the depth to which it is intended that the plow shall run, and held securely at several points of adjustment.

Improved Bureau or Dressing Case Bedstead.

Mark Crosby, Boston, Mass.—The object of this invention is to provide a bedstead in combination with a bureau or dressing-case, so constructed and arranged as to fold in the latter when not in use, and be disposed in a small compass and out of sight. It consists in the combination of a bureau having bottom and rear recesses, with a bedstead having a hinged head section, the said head section sliding in ways into the bottom recess, and the other portion folding in a vertical position in the rear recess. The lower portion of the bureau is also provided with a hinged leaf, which, when the bedstead is drawn out, adds to its length.

Improved Nozzle.

James H. McConnell, New York city.—The nozzle is swiveled to the bulb of a shut-off cock. A plug is inserted through a hole in the side of the bulb, which hole is closed by a screw cap, so formed that its outer surface may be continuous with the surface of the bulb. Upon the inner end of the nozzle is formed a segment, which gears with a segment upon the top of the plug. By this construction, by turning the nozzle in one direction, the plug will be turned to allow the water to flow through the said nozzle; and by turning the nozzle in the other direction, the water will be shut off.

Improved Table.

Louis Postawka, Cambridgeport, Mass.—The head pieces, which are long enough to extend across the table and serve for two legs, are connected by a tenon, fitting in a socket, and are attached to the frame by bolts which pass up to sockets in the upper side of the frame. The posts are mounted on foot pieces which receive the two legs of each end, which, together with the head pieces, form side frames, and the two frames are connected by a stretcher, screwing into them by right and left threads. Mr. Postawka is the patentee of an ingenious and useful improvement in piano stools whereby the seat is raised and lowered by turning a knob at the side, in place of rotating the seat.

Improved Sash Fastener.

Thomas L. Shaw, Laurinburg, assignor to himself and Hugh G. Fladger, Lilesville, N. C.—This invention consists of a pivoted sector-shaped latch piece, which is guided in ribbed inclosing plates, and acted upon by a strong spring bolt for forcing curved V-shaped arms, with tapering ends, into notches of the window casing or sash frame, for retaining the sash in any position, and locking the same. Particulars regarding this invention may be obtained by addressing H. G. Fladger, Lilesville, N. C.

Improved Pianoforte Attachment.

John W. Brackett, Boston, Mass.—This is an improved organ pedal attachment to pianos, which affords the organist and pupil all the advantages of the organ for practice, enabling them to gain the technics of both the piano and organ at the same time. A set of organ pedal trackers' levers, and stickers is combined with the keys of a piano, and stops and their levers are also provided, in connection with the trackers of the device. The value of this invention consists primarily in the facility afforded to students of obtaining practice in the use of the feet in pedaling, and thus acquiring an indispensable qualification for playing the organ when the latter instrument is not accessible.

Improved Faucet for Oil Cans.

Edwin A. Jackson, New York city.—This faucet is arranged entirely within a bell-shaped base part, with faucet barrel and spout, which is soldered to the can. The plug is provided with a hinged and recessed finger piece, to be thrown up for the purpose of turning the plug, and locked in downward position over a spring of the spout for closing securely the faucet.

Improved Slide Valve for Steam Engines.

Henry Bolthoff, Central City, Col. Ter., assignor to himself and James Clark, same place.—This slide valve is composed of two parts, connected with two eccentrics on the main shaft. The eccentrics are so arranged on the shaft that the parts are simultaneously moved in opposite directions. The valve is so set as to about half open the main port, more or less, as the case may require, when the crank is on the center. The upper part is moved in an opposite direction, consequently the full opening is made in less than the usual time required by the ordinary valve. The upper part has on the inside of each port an adjustable jaw, for the purpose of increasing and decreasing the size of the ports for cutting off steam at any point of the stroke that may be desirable.

Improved Quilting Attachment for Sewing Machines.

William H. Null, Blandinsville, Ill.—This invention includes apparatus for adjusting the legs toward and from each other, to vary the hight of the quilt to adjust it to the machine, and to set the benches so that the frame will descend a little to facilitate the feeding. The quilt is attached to rollers, held against turning by a friction band, lever brake, and holding pawl; and one roller has a ratchet, ratchet lever, and pawl for turning it to draw the quilt from one to the other as the work progresses. The quilt is stretched in the direction of the seams by hooks, cords, and a lever, the cords passing over suitable guides, to be operated alike by the lever to stretch evenly at both ends, and the lever being provided with a catch button, to hold it when pulled back to stretch the quilt.

Improved Battening.

John Loppacker, New York city.—The boards are connected by the cleat pieces, and their edges are grooved. Grooves and rabbets of the cleat piece receive tenons of the boards, and a cleat, which overlaps the latter, is held tightly thereto. The lower side of the cleat piece is flush with the lower sides of the boards. By this mode, the boards and cleat pieces are securely locked together, and the possibility of leakage is avoided.

Improved Bottle Stopper.

Joel B. Miller, Rondout, N.Y., assignor to himself and August Yost, same place.—This stopper is located inside the bottle, and has a bale or handle hinged to the top. It is provided with an enlarged upper end, designed to prevent the stopper from falling to the bottom of the bottle, and also to serve as a handle to facilitate the drawing of the device into the neck.

NEW BOOKS AND PUBLICATIONS.

CHEMICAL AND GEOLOGICAL ESSAYS. By Thomas Sterry Hunt, LL.D, F.R.S., etc., etc. Boston, Mass.: James R. Osgood & Co.

Dr. Sterry Hunt has for many years been a highly valued contributor to our current scientific literature, both on account of his learning and attainments and his uniformly graceful and pleasing style. In collating these papers, published originally in magazines or read before scientific associations, he has given us a book of permanent value to the history of contemporary Science; and in it he enunciates many original views and theories, some of which have been justified by actual discovery by himself and other investigators. The paper on "The Theory of Chemical Changes" deserves especial commendation as a model of popular scientific exposition.

THE COMMON FROG. By St. George Mivart, F.R.S., etc. Lecturer on Comparative Anatomy at St. Mary's Hospital, London, Author of "The Genesis of Species," "Elementary Anatomy," etc. Price $1. New York: Macmillan & Co.

From the days of Galvani and Volta, the batrachian has always been a martyr to Science; and on this ground, as well as for its remarkable metamorphosis from a fish to an amphibious animal, it deserves the closest study. Mr. Mivart discusses thoroughly and well the whole of the delicate organization which makes the frog so useful for physiological experiments, as well as the number and variety of its relations to other classes of animated nature.

THE BLOWPIPE: a Guide to its Use in the Determination of Salts and Minerals. Compiled from Various Sources by George W. Plympton, C.E., A.M., Professor of Physical Science in the Polytechnic Institute, Brooklyn, N.Y. Price $1.50. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

Professor Plympton's earlier work on blowpipe analysis has long been recognized as a standard authority; and the volume just received is equally valuable as a text book, while its modern date and comprehensive arrangement make it the manual, *par excellence*, of analysis by the dry method. It is well illustrated, and will be read and consulted by practical scientists as well as by pupils and students.

THE USE OF THE STEAM ENGINE INDICATOR, or Practical Science for Practical Men. By Edward Lyman, C. E., M. A. I. M. E., etc. Price $1, postage paid. Published by the Author, New Haven, Conn.

The use of the indicator is becoming daily more general, and there is need for precise and detailed description of its theory and mechanism which we find excellently given in the treatise before us. Some useful and original tables of pressures at various points of stroke, under steam cut off at different proportions of piston travel, are given, as well as cards showing the merits and faults of engines of all varieties, as displayed by the unerring indicator.

A PRACTICAL AND CRITICAL GRAMMAR OF THE ENGLISH LANGUAGE. By Noble Butler. Price $1. Louisville, Ky.: John P. Morton & Co.

We have to give the highest commendation to this new edition of a standard work, which epitomizes the very numerous and complex rules of formation of our parts of speech in a clear and forcible manner. It is accurate and precise in all its definitions; and the examples are selected with great judgment. A better grammar cannot be put into the hands of the young; while its judicious elucidation of many disputed points will give it interest to students of all ages.

EATING FOR STRENGTH: a Book comprising the Science of Eating, Receipts for Wholesome Cookery and Drinks, and Answers to Questions. By M. L. Holbrook, M D, Editor of "The Herald of Health," etc. New York city: Wood & Holbrook, 13 & 15 Laight street.

This book is a collection of much useful information on the important subject of diet, and contains many practical directions for the preparation of wholesome food.

ILLUSTRATED GUIDE TO THE CINCINNATI EXPOSITION, and Catalogue of the Fine Arts Department. By Daniel J. Kenny. Price 25 cents. Cincinnati Gazette Company.

This book is excellently arranged, and contains much useful and instructive information, besides the matters promised in its title.

A PRACTICAL THEORY OF VOUSSOIR ARCHES. By William Cain, C. E. Price 50 cents. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This useful handbook is No. 12 of Van Nostrand's "Science Series."

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From October 17 to October 28, 1874, inclusive.

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ANSWERS TO CORRESPONDENTS

B. H. can answer his query as to the size of pipe to convey water a long distance by referring to p. 48, vol. 29.—A. Y. McD will find the directions on p. 59, vol. 24, for galvanizing iron pipes sufficiently explicit.—E. F. G. will find directions for making rancid butter sweet on p. 119, vol. 30.—G. A. B. will find a recipe for birdlime on p. 347, vol. 28.—T. D. H. will find recipes for fulminating powders on p. 96, vol. 31.—L. G. D. will find ample instructions for building an ice house on p. 251, vol. 30.—C. E. E. P. can polish stones by the process described on p. 138, vol. 30. A recipe for cement for aquaria is given on p. 274, vol. 30.—G. W. H. and G. P. will find answers to their questions as to suction and siphons on the editorial pages of this issue.—C. J. C. C. should consult a physician.—F. J. B. can bronze iron pipes by following the directions on p. 107, vol. 30.—B. M. & Co. will find a recipe for preserving harness on p. 264, vol. 30.

(1) W. J. R. asks: Is there a flexible pipe made that will stand the heat and pressure of steam, say from 50 to 125 lbs.? I want it to be limber, so that a little power will bend it to any angle when the pressure is on. A. Yes. It is not very flexible; but by giving it sufficient length, it can readily be turned in any desired direction.

(2) J. F. K. asks: What is it that eats away the ends of the enclosed glass tube of a water gage? The tube was packed with rubber, and had been in about one year, under a steam pressure of 50 lbs. A. The tube presents the appearance of having been cut by sand or grit.

(3) J. E. B. asks: I am running a blast engine at a furnace. Four cylindrical boilers, 60 feet long by 30 inches in diameter, in batteries of two boilers each, furnish the steam. There is a steam dome on each set, the domes being connected by the main steam pipe that goes to the engine. One of the batteries became charged with electricity. I opened a brass drip cock that was in the pipe upon the boilers, and left it open until I got the steam turned on. When I went to shut it, I felt a prickling sensation in my fingers, and opened it again. When I placed my finger within ⅛ of an inch of the cock, I could feel it very plainly. Can you explain it? A. It probably occurred from the friction of the water, contained in the steam, against the sides of the orifice.

(4) J. B. S. says: Our safety valve is 4¼ inches diameter; it weighs 5 lbs., lever weighs 5 lbs., and the weight is 75 lbs.; the distance from valve stem to weight is 11½ times the distance from valve stem to fulcrum. At what pressure should it blow off? A. If it works freely, it should blow off at about 67 pounds. 2. The engine is double, the cylinders being 12x24 inches, with a spur wheel (on crank shaft) of 2 feet diameter, geared to a wheel of 8 feet diameter. How many revolutions to the minute should this engine run without injury, working at 75 lbs. steam to the square inch? A. From 60 to 70. 3. We have two boilers set side by side, with 2 inch feed pipe, with check valve at the mud drum of each. Our steam connections are 4 inches in diameter, with a large valve on each boiler for disconnection. We have an equalizer of 4 inch pipe for water connection, with a stop valve in center. We never have any trouble with more pressure in one boiler than the other from unequal firing; when we try the water gages in one boiler, we are sure as to where it is in the other. We feed with either cold or warm, or nearly boiling water. I think if all boilers were connected in this way there would not be so many terrible explosions. A. This is a very good arrangement, and we are much obliged to you for the description. As to strength of boilers, see 193, vol. 29.

(5) G. H. A. asks: Will Babbitt metal make a good piston, if melted and run in a brass cylinder? A. Not very. Your other questions have been repeatedly answered in these columns.

(6) J. B. H. asks: How is the fine wire, of which a mile weighs only a grain, drawn? A. It is enclosed in a mass of other material, and the two are drawn together into wire, after which the casing is dissolved by a chemical preparation.

(7) H. A. T. says: I have an engine 12½x36 inches stroke. I run it without a balance wheel. It has a direct connection of valve stem to eccentric. What lead should it have, and at what point should the cut-off be? A. Give the valve ¼ of an inch lead, when cold. The point of cut-off will generally be regulated by the pressure of steam and the work to be done.

My railroad has a curve in it, about 10 feet in 100, 100 feet long, and then there is 100 feet of straight line. What is the best mode of running on the track so as to get the car round the curve? A. The tracks of street railroads have many such curves, and special appliances are used, which you can obtain from a manufacturer.

(8) C. J. B. asks: What is the process of gumming the parts of a newspaper together, to make it into book form? A. It is done by a machine which folds the paper and at the same time applies paste at the back of the leaves.

(9) E. T. C. says: I wish to put up a lathe for turning hard wood, such as oak and ash, of from 3 to 12 inches in diameter. I am thinking of having two pulleys on the mandrel. Of what diameter, and how broad on the face should they be? A. You can make one pulley 6 inches, and the other 4 inches in diameter. The face of each should be 2 inches. 2. What width of rubber belt should I use? A. Two inches. 3. How many revolutions per minute should the work make? A. From 500 to 800 revolutions per minute. 4. Would pulleys built up of pieces of wood, so as to present the end of the grain to the belt, give good results? A. The pulleys will do better if turned from solid pieces of wood, or lagged and turned off after being built up. 5. How large should a steel or iron mandrel be? A. Diameter of mandrel should be ⅜ inch. 6. What horse power would it take on 9 inch work? A. From ½ to ¾ of a horse power.

(10) H. P. asks: What would be the probable bursting pressure of a cylindrical boiler 28 inches in diameter, of plates ¼ inch thick, with a single row of rivets? A. See p. 193, vol. 29.

Does sharpening cotton gin saws aid in the cleaning of the seed, or does it only increase the speed of the gin? A. Speed is the more important item. The saws do not require to be very sharp.

(11) F. R. M. asks: Will you please give directions and formulæ for designing a good turbine water wheel of the vortex or central discharge kind? A. There have been volumes written on this subject. You will find it ably treated in Rankine's, Fairbairn's, and Weisbach's works. It is entirely too comprehensive for our columns. Moreover, if the best proportions were definitely fixed, there would be no more competition between water wheel manufacturers.

(12) D. asks: Can a band of steel, ½ inch broad and of sufficient thickness to sustain a strain of 150 lbs., be used as a belt on pulleys 4 inches in diameter? A. A piece of the best saw steel, about 1-40 of an inch thick, might answer, but it would be liable to break.

(13) D. M. says: I want to build a small furnace for melting iron. Of what size should it be to work properly? Would a furnace of 12 inches inside diameter and 36 inches high be large enough to make good sound castings? A. The above dimensions will probably give good results. 2. I have read that melting iron on a small scale is never successful. What is the trouble? A. Very small masses of iron are apt to oxidize quickly, which causes the difficulty. 3. What sized of fan blower, with 4 fans, running about 2,500 revolutions per minute, would be required for the above mentioned furnace? A. A blower 9 inches in diameter will do, if properly constructed.

(14) E. D. P. asks: How can I tin gray iron? A. Clean the pieces thoroughly, cover them with a solution of sal ammoniac, and dip them into melted tin.

(15) J. W. S. asks: 1. How many strokes does the sickle or knife make to one revolution of the ground wheels of an ordinary mowing machine? The one which I am planning makes 128 strokes to one revolution of the ground wheels, and works the gear wheels by a screw. A. The speed of the knives is proportioned, in a good mowing machine, to the speed with which the machine advances. 2. Is the machine that makes the most strokes of the knife generally the best? A. Not necessarily.

(16) J. L. G. asks: 1. A saw mill is drawn by a portable engine of 25 horse power. The flues in the boiler leak badly on some days, and on others they will not leak at all. Sometimes the water will stand in the ash pit in a considerable quantity. Is such a boiler safe? A. We would like to have further particulars in regard to this case, such as kind of feed water used, and whether the tubes leak by fits and starts, or after blowing down or cleaning the boiler. 2. How often can the flues in a boiler be upset with safety? A. The tubes can be upset as long as there is enough material left, and sometimes a ferrule can be forced into the end with advantage. 3. The boiler is calculated to carry 100 lbs. steam: is it dangerous to run with 50 or 60 lbs. of steam on? A. If you have a good pump, and are careful, the boiler is not particularly dangerous on account of the leaky tubes, nor would it be unsafe to run the engine as suggested.

(17) W. asks: Why is it that, if you take two musket balls (both alike) and two similar charges of powder, and load them into two guns, one rifled and the other a smooth bore, the ball from the rifled barrel is thrown with so much more force and precision than the ball from the other? A. The greater precision of the ball from the rifle is due to the rotary motion which is imparted to it, and its greater force is probably due to the decrease of windage, and the greater pressure exerted by the exploding powder upon it.

(18) M. B. asks: How can I dye wood black? A. Boil ½ lb. chip logwood in 2 quarts water, add 1 oz. pearlash, and apply hot with a brush. Then take ½ lb. logwood, boil in 2 quarts water, and add ½ oz. verdigris and ½ oz. copperas; strain, and put in ½ lb. rusty steel filings, and with this go over the work a second time.

(19) C. E. E. P. asks: How are carbon plates made for galvanic batteries? A. The carbons for Bunsen's battery are made as follows: The fine dust of coke and caking coal is put into a close iron mold of the shape required for the carbon, and exposed to the heat of a furnace. When taken out, the burned mass is porous and unfit for use; but by repeatedly soaking it in thick sirup, or gas tar, and reheating it, it at length acquires the necessary solidity and conducting power. The carbon that forms on the roof of gas retorts is harder and better than the carbon thus made but it is difficult to work, and the supply of it is limited.

(20) A. B. C. asks: Can more than one wire be supplied from an intermediate battery, all the wires being through wires? For instance, two or more wires work from New York to Philadelphia, with a main battery at Trenton; can both or more lines be supplied without dividing the battery? A. They cannot. An intermediate battery constitutes a portion of the main circuit, and connecting in another wire would have the same effect as crossing the wires.

(21) S. W. says: A few days ago, on examining one of our fire alarm boxes, I found lumps, or solid crystals, of sulphate of copper adhering to the kerite insulation of the wire inside the box. The box is some four or five squares from the office. I am positive the crystals were not on the wire when it was put in the box. The question is: How came the sulphate there? A. It was probably placed there at some subsequent time by some one having access to the box, for the purpose, perhaps, of exciting your curiosity.

(22) J. O'C. and others.—Belts will move towards that part of the pulley where the radius is the greatest.

(23) J. E. H. asks: How can I silver plate a watch case or other articles? A. Place the articles in a bath consisting of two grains of cyanide of silver and two grains of cyanide of potassium in every two hundred grains of water. Connect the zinc poles of a battery of three or four cells to the article to be plated and the copper pole to a piece of silver, which is also plunged into the bath. The passage of the current decomposes the salt, deposits silver on the object, and causes the dissolution of an equal quantity of metal from the silver electrode. The time required for the operation depends on the thickness of coating required.

(24) J. F. A. asks: How many feet of silk covered wire, and of what size, is required for the secondary coil of an induction apparatus capable of producing an inch spark? What is the length of the primary coil? Will the ordinary soft iron of commerce do for the core? A. An induction coil of that capacity would require about 40,000 feet of silk-covered copper wire of 0.0055 inch diameter, or No. 26 Birmingham gage, for the secondary coil. The primary coil consists of two layers of copper wire of 0·1 of an inch diameter or No. 12 Birmingham gage. Ordinary soft iron of commerce will answer very well for the core, but Norway iron is the best for this purpose.

(25) F. C. B. asks: How is an induction coil arranged so that the drawing out of the core increases the strength? How is a coil arranged so that a tube enclosing the coil regulates the current, drawing it out increasing, and pushing it in decreasing, its strength? A. There is no arrangement whereby the withdrawal of the core can increase the inductive effect of a coil. A primary coil when enclosed in a brass tube loses its inductive effect upon the secondary coil, because the induction currents circulate within the tube instead of passing into the secondary coil. By drawing the tube out, and leaving the primary coil within the secondary, the currents circulate in the latter, and thus the inductive effect is increased in proportion as the tube is removed.

(26) C. D. C. asks: What are the characteristics of the Leclanché battery? Is it as intense as the Grove? A. The Leclanché element consists of a zinc rod in a solution of ordinary commercial sal ammoniac; the negative pole is a prism of carbon, tightly packed into a porous vessel with a mixture of peroxide of manganese and carbon, in the form of a coarse powder. The zinc unites with chlorine, forming chloride of zinc, while ammonia is set free at the negative electrode. Its electromotive force is 1·48 volts, while that of a Grove is 1·9 volts. There is no waste of material when the Leclanché battery is not in action; and if the evaporation of the liquid is prevented, it may be allowed to remain untouched for months without losing power. It is, therefore, admirably adapted for working telegraph wires where the open circuit is used, and where the telegraph is not in constant use, as well as for electric bells. When placed in short circuit, it polarizes very quickly, and is therefore not adapted for working local circuits, or for working ordinary main line telegraph circuits on the American closed circuit system.

(27) L. V. R. asks: How can ivory be made ductile, or be reduced to the consistence of putty, so that it could be worked into any desired form? A. Soak it in a solution of pure phosphoric acid, and it will become flexible. Exposure to the atmosphere will harden it, but it may be made again pliable by immersion in hot water.

(28) R. N. asks: Does the 11 seconds of lunar acceleration, per century, mean a total acceleration of 11 seconds in that period, or that the lunar month is now 11 seconds shorter than it was a century ago? A. The total secular acceleration of the moon's mean motion amounts to between ten and eleven seconds per century. See Herschel's "Outlines of Astronomy," pp. 412-419. Lunar perturbations are almost numberless, and are compensated. The retarding influence of the ether of space must be immeasurably small.

(29) C. S. O. says: I have some photographs, the faces of which are somewhat marred; they look as if they had been piled together before the varnish had dried, and then pulled apart. How am I to make them appear all right? They are perfectly new. A. For restoring the surface to photographs, etc., if the scratches do not go through the albumen, wax them. Formula: Dissolve 1 oz. white wax in 2 ozs. turpentine by a hot water bath. Add a few drops oil of lavender which facilitates the solution of the wax, and neutralizes the odor of the turpentine. This has the consistence of butter. On an imperial sized photograph, take a lump the size of a pea, and, with cotton flannel, rub it over the print. Burnish with a clean piece of flannel. This gives a high polish.

(30) N. S. asks: What is put inside casks to prevent alcohol from soaking into the heads and staves? A. Dissolve in a water bath 1 lb. leather scraps and 1 oz. oxalic acid in 2 lbs. water, and dilute gradually with 3 lbs. warm water. Apply this solution to the inside of the barrel, where (by oxidation) it will as

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sumea brown color and become insoluble in alcohol. It will close all the pores of the wood, and will not crack or scale off.

(31) J. J. asks: What are good recipes for composition bronze, and bib and bell metals? A. A good bronze is made of copper 7 lbs., zinc 3 lbs., tin 2 lbs. Another: Copper 1 lb., zinc 12 lbs., tin 8 lbs. Metal for bib and other cocks: Copper 20 lbs., lead 8 ozs., litharge 1 oz., antimony 3 ozs. Bell metal for small bells: Copper 3 lbs., tin 1 lb. For large bells: Copper 100 lbs. tin from 20 to 25 lbs.

(32) N. F. C. says: I have a 2½ inch achromatic telescope, of 44 inches focus; and with the Huygheniah eyepiece I get a power of 80. How high a power will it stand, and how must I coustruct the eyepiece? A. It will bear 125. Then 44÷125=0·352″=equivalent ocus×2=0·704″=focus of field lens: and 0·704÷3=0·235″ =focus of eye lens, showing 0·704—0·235=0·469″=distance apart. 2. How close will it bring, apparently, the moon to the earth? A. Moon's distance in miles, 240,000÷125=1,120 miles.

(33) B. F. H.—Get Webb's "Celestial Objects," third edition. It contains an account of all objects likely to interest the amateur astronomer.

(34) T. M., of Roorkee, British India, and others.—The SCIENTIFIC AMERICAN, bound, will cost you $3 per volume. Volumes 26, 27, 29, are not on sale at present. *Science Record*, three volumes, $6.50 together.

(35) W. P., of Dublin, Ireland, and others.—Captain Simpson's "Report on the Naval Ordnance of Europe" is to be issued by the Navy Department, Washington, D. C.

(36) C. Roggenkamp, Appingedam, Holland.—Subscription to SCIENTIFIC AMERICAN, prepaid postage, $5.08 per annum.

(37) J. T. B. says: 1. In your issue of October 31, you say that it is not safe to cement directly on the walls of an excavation. My father has built hundred of cement cisterns, cementing directly on the eart walls, and I have not known one of this kind of cistern of his make to fail for want of strength. Put on three good trowel coats (the last one containing a little larger proportion of cement), and a brush coat for hard finish, made by mixing cement in water to the consistence of thick cream, and add a pint of fine salt for a large pailful of the finish. Wherever the soil is stable enough to hold its place as the cement is laid on, the brick wall is in no sense needed. It is only money wasted. Of course all cisterns should be protected from frost. A. There are some soils sufficiently hard and permanent to admit of the treatment described by our correspondent, and no doubt such is the nature of the ground in the section of which he writes; but such construction is not safe in all soils, and it is liable to be damaged by surface water in any soil. In most sections of country, cisterns so constructed would be attended with a great deal of risk. It is not merely the looseness and friability of the soil that we have to contend against, but the pressure of the surface water as well, which, when confined by an understratum of clay, is sometimes very considerable, and forms the main difficulty in the construction of dry cellars. This pressure tends to wash away the earth behind the cement, and when thus weakened to break it. Unless H. M. has had the matter proved in his immediate neighborhood, therefore, it will be with him in the nature of an experiment.

1. Suppose I have a pump whose bore is 2½ inches and stroke 4 inches, and (connected with the pump by a two way stopcock) two pipes, one with an inch and the other ½ inch bore, the pipes both leading to the same cistern: How much more water will be supplied to the pump at each stroke by the former than by the latter? A. If the pump is worked with a slow motion, its cylinder will be filled at every stroke, the same by the small pipe as by the large one, the difference being in the greater velocity of the water and consequently greater friction in the small pipe than in the large one; and for this reason, with the small pipe, greater power would be required to work the pump. But the quantity of water drawn at each stroke will be the same in each case. 2. What kind of pipe is best to bring water in, from a well at a distance, the water to be pumped up? A. Iron pipe coated with coal tar would stand well. 3. Which will last the longest ordinarily, underground, iron or lead pipe? A. In some soils, lead pipe is the best, but others soon destroy it.

(38) S. R. M. asks: What is the effect, on the complexion, of gum benzoin dissolved in alcohol? A. Gum benzoin contains about 80 per cent resin and from 15 to 20 per cent benzoic acid. As it is soluble in alcohol, the solution would be a varnish, and would have no more effect than any other varnish, though there is a slight chance of the benzoic acid being irritant to the skin.

(39) A. L. C. asks: 1. How many rings has the planet Saturn? A. Saturn has three principal rings or streams of satellites; the innermost is the gauze or crape ring. Five of the eight satellites should be seen in a four inch achromatic. 2. Do they all revolve around the planet in the same time? How does the time of their revolution compare with the rotation of the planet on its axis? A. Saturn rotates in about 12 hours; the rings revolve more slowly. 3. Does the rotation of the planet on its axis appear to be in the least affected by the attractive force of the rings? A. No. 4. If I understand the principle of the whirlpool, it is that the speed of the water is increased as it nears the center; am I right? If a ball constructed of some floating material be dropped into the whirlpool near the outer edge, where a slow projectile motion would be imparted to it, would it at the same time take a slow rotary motion? A. Fasten a bullet to a thread and let it revolve around a stick. As the pendulum shortens, the bullet moves faster. 5. As the ball comes nearer to the center of the vortex, would its rotary motion be increased at a corresponding rate to its projectile motion? A. No.

(40) B. S. says: I have two lenses, one of which has a focal distance of 5¾ inches, and a diameter of 1½ inches; the other is 1 inch in diameter with a focal distance of 12 inches. Putting them together in the form of a telescope, the objective being the small glass, 12 inches being the distance, an object at a distance of 3 or 4 miles is plainly seen. How can I combine them so as to see plainly at a good distance, being nearsighted? A. Place your lenses 17¾ inches apart.

What is the process of photography from the clean paper to the development of the picture? A. See Carey Lea's "Manual," or Dr. Vogel's "Handbook of Photography."

(41) G. M. H. asks: 1. Can the achromatic lens of an ordinary photographic camera be used as an objective for an astronomical telescope, to any advantage? A. We find by experiment that view tubes and portrait combinations may be used as telescopes, taking out the stops, with a focussing glass or pocket magnifier as an eyepiece. 2. What power of eyepiece would be most desirable for a lens, of 1⅝ inch diameter and 10 inch focus? A. The power should be low, about 30, and the glasses well centered, or collimated.

(42) A. L. C. says: 1. As the eclipse of the moon was passing off, on Sunday morning, October 25, the northwestern edge was first made luminous, being nearly opposite the point of contact. How do you explain that phenomenon? A. Because the moon passed through the earth's shadow very near its edge. 2. Is there any difference, by actual measurement, between the equatorial and polar diameters of the moon? A. A stereograph of the moon shows a bulge or projection toward the earth. The invisible side is supposed to be thirty miles lower than the visible one. 3. Can the polar axis of the moon be other than perpendicular to the plane of its orbit? A. The moon's axis is inclined to the ecliptic 1° 30 10,·8″. Its orbit is inclined 5° 8′ 47·9″. 4. What is the average diameter of the satellites of our solar system? A. They range from Titan, sixth satellite of Saturn, which is over half the diameter of the earth, and Jupiter's satellites, respectively 2,240, 2,192, 3,579, and 3,062 miles, to the minute spheres forming the rings of Saturn, and the meteorites, which are the *debris* of comets. 5, How do you find the parallax of the sun? A. By measuring the displacement of Venus on the sun's disk, with the distance in latitude between two observers as a base line. 6. If I were standing on the equator, I should see the pole star in the horizon; but if I am in latitude 42°, do I see more than 42° below the pole? A. No. 7. Why does the pole star appear so much nearer to the zenith than the horizon, to one thus situated? A. The pole star is about a degree and a half from the pole.

Why does more fruit fall during the night than during the day time? A. If the fact is as stated, it is because the deposit of dew makes fruit heavier at night.

(43) J. D. L. asks: 1. What is the best work on grinding and polishing lenses, one that contains all or nearly all the modern practice of opticians? A. We should be glad to hear of such a work, modernized. As any person can make an achromatic by following directions, with patience, intelligence, and "warranted" glass, the lesser opticians at times conceal their improvements. Our special information on achromatics has been collected by an amateur, and will not be found elsewhere. Among the leading opticians, Steinheil and G. & S. Merz determine whether a lens has the requisite curvature by placing a lens of correct and opposite curvature above it, and illuminating through a piece of tissue paper. If the parallel rainbow diffraction bands, crossing the lenses, are straight, then the surfaces are alike; if the bands are curved, they are unlike. Clark uses a home-made wooden spherometer, and works to the two hundredth part of an inch, whereas the continental opticians follow Fraunhofer, and endeavor to have their work correct to the thousandth of an inch (see Prechtl's "Dioptrik"), and to dispense with local correction, which is necessary after all. Steinheil cuts a prism in two by hand with a steel wire bowstring armed with diamond dust, instead of a lap. The force for his little hypocycloid polishing machines is supplied by the left arm of the workman turning a horizontal fly wheel. Clark uses a steam engine for rough grinding, and a vertical iron wheel fed with sand and water instead of the traditional lead grinder. In subsequent operations, he puts the iron grinder on the stump of a tree, and walks round it, moving the lens to and fro by its handle. He does pitch polishing by hand, with rouge and a wooden disk, the surface cut into one inch squares and diagonals, retouching with the forefinger dioped in rouge, if zones of different focus have formed in polishing. Fitz and others use the machine for local correction, nearly as figured by Draper. Foreign opticians fasten a lens with uniform drops of pitch half an inch apart, while ours use it solid. 2. What is the best method of bending a plate of glass in a true spherical concave? A. It is better to grind out and polish the cavity. A plate of glass will curve slightly without buckling when sufficiently softened by heat, and take the shape of an iron mold beneath it.

(44) N. Y. asks: 1. What quantity of water converted into steam is used in computing the horse power of boilers? A. There is no fixed standard. 2. What is the horse power of a locomotive firebox boiler, with a grate 42x44 inches, and a cylindrical part 4 feet in diameter, with 43 three inch tubes 12 feet long, and dome 24x24 inches? A. There is no rule that applies to this question. 3. What would be a fair evaporation per pound of coal in such a boiler? A. From 7 to 8 pounds.

(45) D. D. asks: If a boiler and a tank are placed 50 yards apart, and connected by a 1 inch pipe, would the pressure be the same in both? A. Yes.

Does brass expand as iron does, when heated to the same degree? A. No.

When the boiler of the fireless locomotive is filled, do they force any steam in with the water? A. Yes.

(46) W. H. says: I am about to build a current wheel to be used in the Niagara river, where the current runs about 5 miles per hour past my wharf, depth of water being from 12 to 15 feet. The wheel is on the principle of a windmill or propeller wheel, and is to be wholly submerged. I wish to utilize the power to the extent at least of 12 to 15 horse power. What size of wheel and number of fans would you advise? How many square feet should there be on each fan? A. Your plan is somewhat novel, and you will have to make experiments in order to determine the best proportions.

(47) M. H. asks: What is the most approved method of putting locomotive cylinders in line with the main slabs? A. It would require too much space to make the method plain, and you will get a much clearer idea by personally inspecting the work.

What are the best works on mechanical drawing, and on the link and slide valve? A. Professor Warren's works on drawing are very thorough; and Auchincloss "On Link and Valve Motions" is the standard authority.

(48) W. B. says: 1. I am building a small boat engine; it is vertical, 3½ inches stroke x3½ inches bore, to run 300 revolutions per minute, and to use steam for the whole of the stroke, of 125 lbs. pressure. My boat is a common row boat, clinker built, 18 feet long by 4 feet 4 inches beam. Of what size should my boiler be to supply the requisite amount of steam? A. Make a boiler 2 feet in diameter and 3 feet high. 2. Of what size should my screw wheel be? A. From 20 to 24 inches in diameter. 3. The boat draws about 6 inches, will it be weighted down enough to immerse the wheel when the machinery and 6 persons are in it? Its full depth is 21 inches. A. You can readily determine whether your boat will come down enough by placing weights in it. 4. Of what size should the pump be? A. Large enough to throw twice the quantity of water required.

(49) J. A. B. says: 1. I am building a boat, 32 feet long by 8 feet beam, and 3 feet deep. I am putting in a boiler, 8 feet long by 24 inches diameter, and an engine 5 inches bore by 12 inches stroke, to drive a screw wheel, geared with a 3 feet, a 2 feet, or a 1 foot wheel. By which should I get the most speed? A. A few experiments will be your best guide in gearing the propeller wheel. 2. How many miles an hour will it make? A. The boat will probably go from 5 to 6 miles an hour. 3. What size should the propeller be? A. Make the wheel as large as convenient.

(50) H. H. says: I purpose building an oil tank, ten feet square and four feet deep, of two inch plank, as a plain wooden tank would leak. I think of lining it with ordinary galvanized sheet iron, with soldered joints. Is there anything objectionable in this plan? A. No. It will answer very well.

(51) G. L. L. asks: How can I make and arrange a kerosene lamp for the purpose of heating a small boiler? A. Your best plan will be to buy one. There are a variety of such lamps in the market, many of which give satisfactory results.

What is white metal? A. Parts by weight, tin 82, lead 18, antimony 5, zinc 1, copper 4.

(52) N. O. V. asks: In what manner can two steam governors be tested to ascertain which is the best? A. Belt them from the same shaft, and see which will lift the most weight under variations of speed, and also which is the most sensitive, when running at a high velocity, to a slight change of speed.

(53) D. C. H. says: I am running a horizontal steam engine 12x6½ inches cylinder, with the valve face against the side of the cylinder; the slide valve consequently rides on its lower side. The valve annoys me very much by a constant clicking noise, by being forced away from the face and then back again. Why is this? Should not the pressure in the steam chest keep it up to its place? The valve has nearly 1-16 inch lead, which gives about ⅜ inch lead to the exhaust. Could the feed water heater cause a back pressure sufficient to force the valve from its face? How can I make it work quietly? A. It is quite likely that the exhaust closes too soon, so as to cushion above the steam pressure.

(54) G. C. H. asks: Does melting and remelting lead make the pure metal any lighter? A. Some of it will be probably vaporized.

What is the philosophical reason that a circular saw cuts better at a certain speed than it does if run faster? A. We do not know that this is a fact.

(55) H. B. asks: What should be the exact dimensions of the different parts of a small steam engine, the cylinders of which measure 2½x1½ inches? What sized boiler, with what number of tubes, should be employed to furnish steam to two cylinders of the above dimensions? A. You will find the most of these dimensions in back numbers.

Is there any solder for soldering brass, of the same color? A. Yes. Take copper 32 parts by weight, zinc 29 parts, tin 1 part.

What work on the steam engine would you advise an amateur to read? A. Bourne's "Catechism of the Steam Engine" is one of the best.

Would a combination of pulleys and bands serve to reduce the speed of a foot lathe as well as a back-geared head? A. It would answer, but not as well as gearing.

Would the above described engine be large enough to run a lathe swinging eight inches? A. Yes.

(56) J. C. P. asks: If a perfectly tight vessel, of 4 gallons capacity, contains 1 gallon of water, and is of sufficient strength to resist any amount of pressure by heat applied to the same, would any portion of the water evaporate? A. It would all be converted into steam, if sufficient heat were applied.

(57) F. O. asks: How can I make fruit trees bear well? Last season the plum and pear trees were full of blossoms; but they bore little fruit. The apple trees were loaded, but the apples fell to the ground with worms in them. A. You must remove all the worms, and coat the trunks and roots with a preparation which you can obtain from a seedsman.

(58) H. M. asks: How many inches high inside must I make a box to contain one barrel, if the inside measure of the box is 10x16 inches? A. Divide the number 1256·64 by the cross section of the inside of the box in inches. The quotient will be the hight of the box in inches.

(59) G. S. S. asks: When a pair of scissors cut paper or any material, which blade does the cutting, the upper or lower, supposing that both blades are closing together? A. Both blades exert a shearing force, in such a case. If one blade be kept still, the other will do the shearing.

(60) W. J. S. says, as to the difference between a perspective view and a photograph: A photograph taken with a non-distorting (architectural) lens is absolutely identical with a correct perspective drawing taken from the point at which the lens is placed. Any one may prove this by placing the eye at the point where the lens was, and tracing the view on a piece of glass interposed between the eye and the view. If the distance between the eye and the plate is the same as the focal length of the lens, the two will absolutely coincide. A. We have never seen a non-distorting lens, and doubt if it can be made.

(61) G. F. T. asks: How can I tin the inside of a copper boiler? A. Clean it thoroughly, and then put it into melted tin to which sal ammoniac has been added. Move the boiler about, so that the melted metal will cover every part.

(62) J. H. P. asks: 1. Do oxygen, nitrogen, and carbonic acid, when heated, expand similarly, according to their volumes? A. The greatest expansion is between 32° and 212° Fah.; 1 volume of hydrogen, at 32° becomes 1·36613 at 212°, and one volume of carbon dioxide at 32° becomes 1·37099 at 212°. Such slight differences are observed in nearly all gases; but practically speaking, all gases expand 1-273 part of their volume for every 1·8° Fah. of increase of temperature. 2. Is moisture contained between the particles of gases? A. No.

What accounts for the colors of the African and Caucasian races respectively? A. The deep color of the African is due to a pigment in the cells of the epidermis. The pigment and epidermis of a negro were analyzed by Scherer, with the following results:

	Pigment.	Epidermis.
Carbon	58·27	50·34
Hydrogen	5 97	8 31
Nitrogen	13·78	17·22
Oxygen	21·98	25 63
	99 98	100·00

This would prove the color to be due to an excess of carbon.

Is there a substitute for tobacco that can be manufactured into cigars? A. We know of none.

How is bronzing on steel done? A. The usual method is that of coating the metal with good size varnish and then dusting over it the metallic bronze powder. When dry, it is again varnished over. As to the mastodon's tooth, write to the Academy of Natural Sciences Philadelphia, Pa.

(63) W. W. H. asks: 1. What degree of heat is required to kill trichinæ in cooking? A. 212°. 2. Will boiling kill them sooner than frying? A. Yes

(64) O. A. F. asks: 1. Can you give me a recipe for a good hair oil? A. Castor oil, 6½ pints, alcohol 1½ pints, oil of citronella ½ oz., lavender ½ oz. Shake well before each application. 2. What solution will do to wash the head with, and not injure the hair? A. See answer to J. L. on this page.

(65) J. L. asks: What is the best thing for washing the head with, which will make a lather and not injure the hair? A. Take aqua ammonia 3 ozs., salts of tartar ¼ oz., alcohol ½ oz., and soft water 2½ pints; perfume with bergamot. In applying, rub the head until the lather goes down, then wash out.

(66) W. S. B. asks: What preparation can I use on my hair to keep it soft and make it retain its color, and at the same time keep the scalp clean? A. If your hair is losing its color, hair oil will not make it retain its hue. See answer to J. L. on this page.

How can I clean thin buckskin gloves? A. Try benzine.

(67) W. V. G. asks: How can I destroy graybacks in clothes that cannot be washed? A. Sprinkle your clothes with chloroform, and pack them in a chest excluding the air. Two days under the influence of chloroform should exterminate them.

(68) S. R. asks: 1. Will sumac grow best in rich or poor ground? A. Put in a dry loam, though it will grow well in any common soil. 2. How far apart should it be planted? A. Four feet would be plenty; if it be a small kind, three feet would be sufficient. 3. After planting, should the ground be cultivated? A. That is a matter of experiment. It grows as well on poor as on rich soil, and we should say very little cultivation is necessary. 4. How is the curing done? Should I spread it on the ground like hay? A. With the best varieties, the plant is usually cut while in a soft state and carefully dried till the leaves can be pounded when it is thrashed with flails, the stems and coarse sticles raked out, and the leaves packed in barrels sold.

(69) J. B. says: Every few months I suffer severely from an attack of the cramp in the stomach. I have frequently tried as a remedy brandy, whisky, morphine, etc., but have secured relief only on the application of a strong mustard plaster. Will you explain the nature and cause of these long cramping spells, and how the mustard plaster effects a cure? A. The cramp of which you speak may arise from a variety of causes, chiefly, however, from the accumulation of gases in the canal. The distension paralyzes the proper muscles to such an extent as to prevent its expulsion. The plaster seems to set up a nervous reflex excitability, probably through the medium of the sympathetic system, and a proper tone is restored. This is, however, entirely inferential.

(70) O. asks: How does gelatin clarify coffee? The action of gelatin in clarifying coffee is due to its combination with the tannic acid which is a large constituent of the berry. In boiling the geletin in coffee, it forms a precipitate of tannate of gelatin, which acts precisely like albumen in collecting all sedimentary matter; but a much longer time is required for the precipitate to settle. The bulky precipitate of the egg separates at once when the solution reaches the boiling point.

(71) C. S. H. says: Passing a house recently, the owner remarked that he had a show, and invited me in to see it. Entering, I found myself in a hall or entry about six feet square, with a door on each side. Opposite the front door was a blank white wall. Placing me in the left hand front corner of the hall, he directed me to look at the blank wall above spoken of. I saw nothing but darkness at first: but in about a minute and a half a faint tinge of a ocher color showed through the darkness. This increased in clearness and distinctness until, in about four minutes, a perfect picture of the house on the opposite side of the street stood outlined upon the wall; the color, the windows the folds of the curtains, the fences, and the foliage of the trees, were distinct and beautiful, in a picture about two feet square. A little examination showed that the picture was transmitted through the keyhole of the front door; but by what process it is magnified and so vividly produced is a mystery to me, as to all others who have seen it. It is only three days since it was first discovered by accident. Can you explain it? A. When luminous rays, which pass into a darkened chamber through a small aperture, are received upon a smooth white surface, they form images of external objects. These images are inverted; their shape is always that of the external objects, and is independent of the shape of the aperture. In the camera oscura, the brightness and precision of the images are increased by means of lenses. The principle is the same in both cases.

(72) E. W. F. asks: How are the sheets used in manifold writing prepared? A. Take soft printing paper, and smear with any clean grease mixed with plumbago or lampblack. Leave for 12 hours in a dry place. This is for black paper. Other finely ground pigments may be used to produce the desired color.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:

W. D. S.—The fragments are part of a fulgurite or lightning tube. For full information, see pp. 3, 274, vol 31.—O. P.—Your specimen contains carbon, but burns with such difficulty that it is doubtful (as far as we could judge from such small specimens) whether it could be used for coal.

L. K., of Konigsberg, Austria, asks: How can I make carbolic soap?—T. M., of Roorkee, British India, asks: What is the greatest length of railway that has ever been built in one day of 12 hours, in the United States?—S. asks: How is the ordinary rim or flange cartridge charged? Is it possible to recharge the copper shells without expensive apparatus?—G. F. S. asks How can I recolor coral when the original color has been drawn by heat?—E. A. D. asks: What is the composition used on the back of postage stamps?—F. J. H. asks: Can any one tell me of a means of calculating the distance between two points on the surface of a globe, angle and length of the two radii (which, of course, are in the same plane) being given?—A F. asks: How can I clean point lace, which has grown yellow with age?

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COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Aerial Navigation. By G. W. M.
On Grinding Plane Irons. By A. C.
On Some New Dyes. By A. D.
On Gongs. By C. L.
On Feathering Arrowheads. By R. K. Y.
On the Divining Rod. By W. C.
On Swinging Saloons. By W. S. T.
On the Phylloxera. By M. L. R.

Also enquiries and answers from the following:

S. F. B.—H, E. C.—A. A. F.—L. F. W.—N. A. H.—J. C.—J. W. D.—W. D. D.—A. G.—C. H. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc. will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who makes a pulver izer, suitable for powdering dry manure? Whose is the best process for drying lumber by exhaust steam?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

November 3, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

31,324.—LOOMS.—W. Meerkland. January 20.
31,337.—REVERBERATORY FURNACE.—J. Reese. Jan. 20.
31,546.—POLISHING IRON.—B. Lauth. February 10.

EXTENSIONS GRANTED.

30,594.—DOOR LATCH.—T. Slaight.

DESIGNS PATENTED.

7,814.—STOVE.—W. P. Abendroth, Port Chester, N. Y.
7,815.—PICTURE HOLDERS.—J. Barnes *et al.*, Gilman, Ill.
7,816 to 7,819.—CARPETS.—R. R. Campbell, Lowell, Mass.
7,820.—STOVE.—G. Comstock, Keokuk, Iowa.
7,821 to 7,823.—EMBROIDERY.—E. Crisand, New Haven, Ct.
7,824 to 7,826.—MEDALS.—T. W. Derousse, Philadelphia, Pa.
7,827 to 7 829.—MEDALS.—T. R. Hartell *et al.*, Phila., Pa.
7,830.—ORGAN CASE.—S. Hayward, Boston, Mass.
7,831.—JACKETS.—M. Landenberger, Philadelphia, Pa.
7,832.—BOTTLE.—G. Mackay, Rochester, N. Y.
7,833 to 7,835.—ORGAN CASES.—W. W. Neüer, Wilkesbarre.
7,836.—BOTTLES.—C. C. Woodworth, Rochester, N. Y.
7,837.—COMPASS CARDS.—D. Baker, Boston, Mass.
7,838.—BRACKETS.—W. H. Britton, Milford, Mass., *et al.*
7,839 to 7,841.—CARPETS.—J. M. Christie, Kidderminster, England.
7,842 & 7,843.—ORGAN CASES.—S. Hayward, Boston, Mass.
7,844 to 7,846.—OIL CLOTH.—C. T. Meyer *et al.*, Bergen, N. J.
7,847.—CHILD'S CARRIAGE.—J. Sues, Louisville, Ky.

TRADE MARKS REGISTERED.

2,046.—LUBRICATING OILS.—Am. L. O. Co., Cleveland, O.
2,047 & 2,048.—NURSING BOTTLES.—M. S. Burr & Co., Boston, Mass.
2,049 & 2,050.—PLOWS.—E. E. Lummus & Co., Boston, Ms.
2,051.—FRUIT JELLIES.—Sherwood *et al.*, New York city.
2,052.—WASHING EXTRACT.—A. Döring, New York city.
2,053.—GROCERIES.—A. Godillot, New York city.
2,054.—PILLS.—S. D. Howe, New York city.
2,055 & 2,056.—TOBACCO.—Marburg Bro's, Baltimore, Md.
2,057.—ORGANS.—R. Nicholls, Philadelphia, Pa.
2,058.—NIGHT SHIRTS.—Perego's Sons, New York city.
2,059.—TOWELING.—Stark Mills, Manchester, N. H.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade Mark $25
On filing each application for a Patent (17 years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
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On application for Extension of Patent $50
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On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, NOVEMBER 7 to 14, 1874.

4,026.—L. A. Dessaulles and Wm. Murphy, Montreal, Can. Améliorations aux œillets servant au passage des lacets pour fermer les chaussures, dits "Oeillets pour Lacer les Chaussures." (Improvements on Eyelets for Boots.) Nov. 7, 1874.
4,027.—W. Shaver, Kemptville, Ont. Improvement on attachments for sewing machines, called "Shaver's Attachment for Sewing Machines for Laces, Braids, etc., with Hem." Nov. 7, 1874.
4,028.—A. D. McKenzie and O. G. Hughes, Toronto, Can. Improvements in dumping wagons, called "McKenzie's Improved Dump Wagon." Nov. 7, 1874.
4,029.—G. D. Thornhill, Xenia, Greene county, O., U. S. assignee of W. Coulter, Albany city, U. S. Improvements on car couplings, called "Coulter's Car Coupling." Nov. 7, 1874.
4,030.—J. Bardsley, Akron, Summit county. O., U. S. Improvement in spark arresters, called "Barsley's Spark Arrester." Nov .7, 1874.
4,031.—J. Gregory, Wingham, Huron county, Ont. Useful middlings purifier, called "Gregory's Improved Middlings Purifier." Nov. 7, 1874.
4,032.—J. S. Robinson, Canandaigua, Ontario county, N. Y., U. S. Improvement on the method or process for hardening and toughening the surfaces of cast iron, called "Robinson's Improved Process for Chilling, Carbonizing, and Toughening the Surfaces of Cast Iron Moldboards for Plows and other Castings." Nov. 7, 1874.
4,033.—F. Snowball and J. C. Nichol, Montreal, Canada. Composition for artificial marble or stone. Nov. 7, 1874.
4,034.—J. B. Armstrong, Guelph, Wellington county, Ont. Improvements in furnaces for heating steel in tempering, called "Armstrong's Improved Tempering Furnace." Nov. 7, 1874.
4,035.—J. Absterdam, New York city, U. S. Improvements on process for the manufacture of illuminating gas, called "Absterdam's Process for the Manufacture of Illuminating Gas." Nov. 7, 1870.
4,036.—J. Bird, Naugatuck, New Haven county, Conn., U. S. Improvements on self-binding pulley blocks, called "Bird's Eccentric Pulley Block." Nov. 7, 1874.
4,037.—J. Judson and W. A. Cogswell, Rochester, Monroe county, N. Y., U. S. Improvement on steam governors, called "The Judson Steam Governor." Nov. 7, 1874.
4,038.—J. B. Orr, Glasgow, Scotland. Improvements on obtaining a white pigment, and in the process employed therefor, called "Orr's White Enamel Paint." Nov. 7, 1874.
4,039.—M. Chase, Jr., and C. S. Muir, St. John's, New Brunswick. Improvements on shingle machines, called "Chase & Muir's Shingle Machine." Nov. 14, 1874.
4,040.—M. Callan, Innerkip, Oxford county, Ont. Improvements in lime kilns, called "The Dominion Champion Lime Kiln." Nov. 14, 1874.
4,041.—D. W. Long, Parkersburgh, Wood county, Va., U. S. Improvements on hinges, called "Long's Surety Hinge." Nov. 14, 1874.
4,042.—S. Wilmarth, Malden, Middlesex county, Mass., U. S. Improvements on water engines or motors, called "Wilmarth's Water Engine or Motor." Nov. 14, 1874.
4,043.—A. Rodgers, Muskegon, Muskegon county, Mich. U. S. Improvements on a machine for moving logs, called "Rodgers' Log Mover." Nov. 14, 1874.
4,044.—J. W. Upson, Tallmadge, Summit county, O., U. S., U. S. Improvements on an apparatus for screening and loading coal, called "James W. Upson's Apparatus for Screening and Loading Coal." Nov. 14, 1874.
4,045.—W. Golding, New Orleans, Orleans county, La., U. S. Improvement on steam generators, called "Golding Steam Generator." Nov. 14, 1874.
4,046.—T. L., I., C. B., and J. M. Hubbard, Port Huron, St. Clair county, Mich., U. S. Improvements on ship's winches, called "Hubbard's Ship Winch." Nov. 14, 1874.
4,047.—M. A. Cushing, Aurora, Kane county, Ill., U. S. Improvements on hot air furnaces, called "Cushing's Tubular Warm Air Furnace." Nov. 14, 1874.
4,048.—D. P. Dieterich, Philadelphia, Philadelphia county, Pa., U. S. Improvements on gum shoes or sabots, called "Dieterich's Gum Shoe." Nov. 14, 1874.
4,049.—F. Barber, Detroit city, Mich., U. S. Improvements on revolving chairs, called "Barber's Rocking and Tilting Revolving Chair." Nov. 14, 1874.
4,050.—W. Beck, Batavia, Genesee county, N. Y., U. S. Improvements on metallic hoop locks, called "Beck's Metallic Hoop Lock." Nov. 14, 1874.
4,051.—W. Beck, Batavia, Genesee county, N. Y., U. S. Improvements on tyre tighteners, called "Beck's Tyre Tightener." Nov. 14, 1874.
4,052.—J. E. Dustin, A. L. Brown, and W. G. Brown, Whitefield, N. H., U. S., and A. Ordway, Lawrence city, Mass., U. S. Improvements on spark arresters, called "Dustin's Spark Arrester." Nov. 14, 1874.
4,053.—H. B. Casgrain, Ottawa city, Ont. Extension of No. 150, called "The Universal Office File." Nov. 14 1874.

Advertisements.

Back Page ..... $1.00 a line.
Inside Page ..... 75 cents a line.

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Friday morning to appear in next issue.

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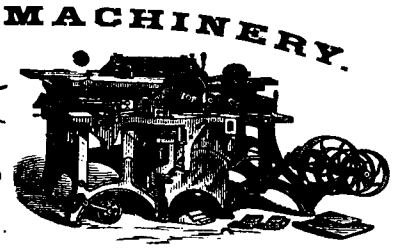

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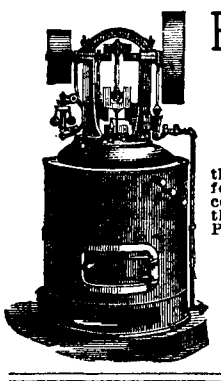

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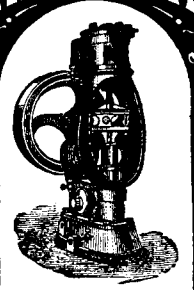

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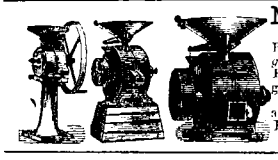

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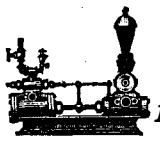

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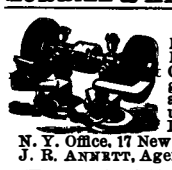

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